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BY HILMAR PAPST.

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BY CHARLES T. PHILLIPS.

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ELECTRIC HEADLIGHTS.
BY J. G. SCRUGHAM.

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JOURNAL OF ELECTRICITY
POWER AND GAS
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VOLUME XXXII SAN FRANCISCO, FEBRUARY 7, 1914 NUMBER 6

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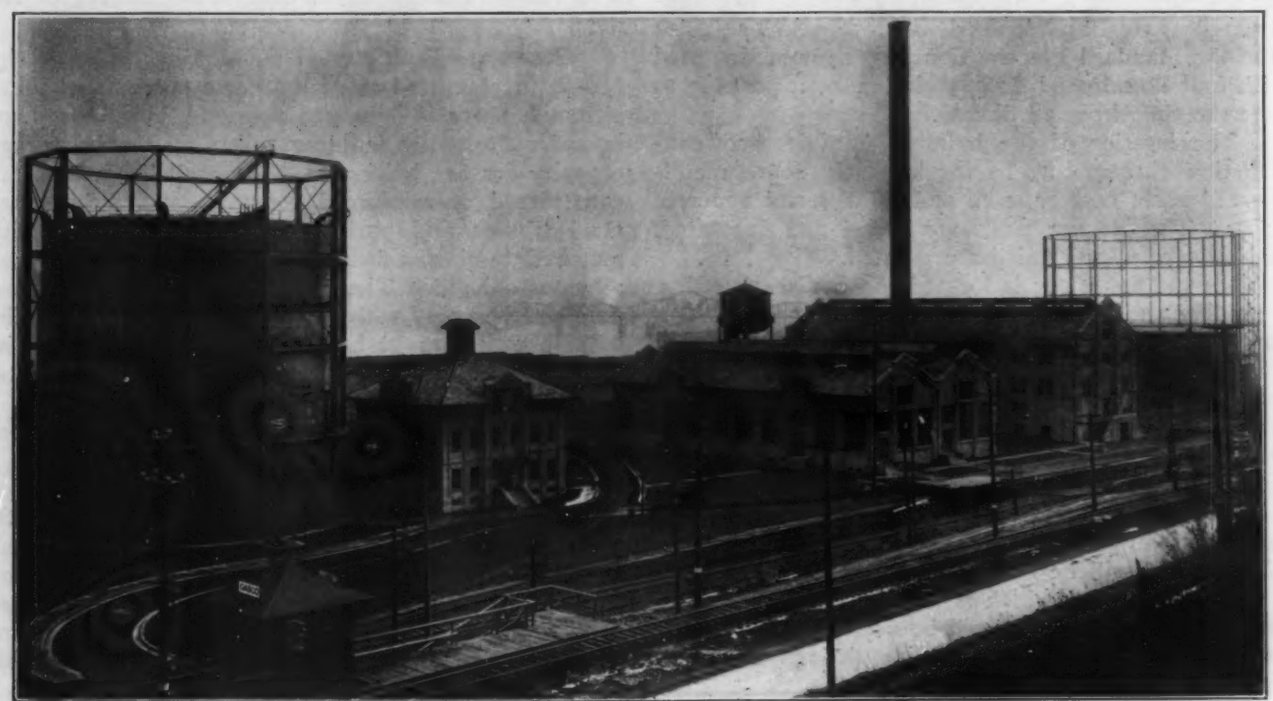
NEW PLANT PORTLAND GAS AND COKE COMPANY

BY HILMAR PAPST.

(In introducing his subject the author mentions that this public utility in making necessary extensions took advantage of the opportunity then presented to co-operate with the municipality in a "city beautiful" movement, and in describing the new plant and buildings shows how this was realized. The plant, which is quite modern, is described by Mr. Pabst, who is general manager of the Portland Gas & Coke Company.—The Editors.)

The Portland Gas and Coke Company having outgrown the facilities of its present plant, which is located in the heart of the wholesale section of the city, and also because of the manufacturing process being dirty, creating a great deal of smoke, soot, etc., it was decided to remove the plant to the outskirts of the city, in order that no offense might be given, and that a plant be erected in keeping with plans for beautification of the city. Construction work was started in June, 1911, and gas was made on October 26, 1913, or a little over two years. No money or effort had been spared to make this plant the most modern and complete. Particular attention has been paid to the elimination of whatever has heretofore been the source of complaint against gas works. In other words, the plant has been designed with a view of reflecting credit on the city and the community. It has cost $1,150,000.



General View of New Gas Plant of the Portland Gas & Coke Company.

Dock and Driveway.—The dock, which is 72 ft. wide by 106 ft. long, is built on the government harbor line and is connected with the land by a 24 ft. roadway with a walk and hand rail on either side. It required 237 piles, having an average length of 72 ft., and over 140,000 ft. of lumber to construct. The dock is provided with slips for accommodating small boats and dolphins and for mooring large craft. A sheer boom, approximately 700 ft. in length, was built to protect the dock and driveway from drift-wood and other floating debris.

The bulkhead, which is 1680 ft. in length, consists of two rows of piles 16 ft. apart, driven 8 ft. on centers, covered with two-inch planks, thoroughly braced

and battened. The whole required 417 piles, having an average length of 32 ft., and over 81,000 ft. of lumber.

Fill.—The fill, consisting of 182,000 cu. yd., was made by the Port of Portland's dredge, Columbia, and was accomplished in six weeks. The earth was pumped out of the river, thus deepening and widening the channel, at the same time making the fill.

Holders.—One holder, having a capacity of 505,000 cu. ft., was constructed for the purpose of storing the gas prior to being pumped into the city, and one additional holder, having a capacity of 650,000 cu. ft., was dismantled at Fourteenth and Couch streets, shipped and re-erected in a new steel tank at the new plant, for the purpose of receiving the gas immediately after having been manufactured.

Office Building.—This building is 52 ft. by 52 ft. in plan and three stories in height, with a one-story addition in the rear 45 ft. by 90 ft., used for meter room. The walls and floors are constructed of reinforced concrete and the roof of steel trusses and purlins, which are covered wtih matched lumber, asbestos felting and composition asbestos shingles. The outside walls are bush-hammered or tooled over the entire surface of the concrete, which gives the effect of cut granite. The cornice, down-spouts and other metal work are of copper. The hipped roof of the main building is surmounted by a clock tower constructed of steel and covered with copper. The clock is of the Standard Electric Company's make, designed with four illuminated dials, which make it possible to note the time from all directions.

The interior of the building is of fireproof construction throughout, having kalamein doors, metal-covered sash, casings, etc., and terrazo and concrete floors. The interior walls are tinted and decorated, and all frames and finish are painted.

On the first floor is located the engineer's office, a reading and lounging room for the men, a kitchen, completely equipped for the use of the men during lunch hours, a large room for the timekeepers and foremen, and a spacious hallway.

The second floor contains the chemical laboratory, wash and dressing rooms, including bath tubs, shower baths and lockers, and a bedroom completely equipped for emergency use; while the third floor is a large assembly hall in which the details and general work of the plant will be discussed.

The basement, which is finished equal to the remainder of the building, will be used as a storeroom, in which a complete stock of pipe, fittings and other necessities will be carried.

In the meter room, in the rear of this building, as described, is one large gas station meter 16 ft. in diameter and 16 ft. long, with provision for two additional meters. These meters will measure all gas made, prior to delivery into the city.

Machinery Building, or Power House.—This is 90 ft. by 150 ft. in plan, and one story high, with large basement. The walls and floors are constructed of reinforced concrete, and the roof of steel trusses and purlins, which are covered with matched lumber, asbestos felting and composition asbestos shingles. The underside of the roof is thoroughly fireproofed with asbestos protected metal. The outside walls are bush-hammered the same as the office building, and the cornice and other sheet metal work is of copper. The interior is fireproof, having tile partitions, metal window frames and doors. It is tinted and painted throughout.

Here the power for operating the various machinery around the plant is generated. One battery of 300 h.p., high-pressure, superheated steam boilers has been installed and provision made for two additional boilers. One steel stack 10 ft. in diameter and 200 ft. high, has been erected with breeching and necessary openings left for connectors to future boilers. Two 500 kw. alternating current electric generators have been installed complete, including exciters, switchboards, condensers and other accessories. Two centrifugal gas exhausters, each having a capacity of handling 5000 cu. ft. of gas per minute against one pound pressure, have been erected for pumping the gas through apparatus for purification. Two steam-driven compressors, each having a capacity of handling 5200 cu. ft. of gas per minute against 20 lb. pressure are installed complete, including condensers, for the purpose of pumping the gas into the city. One traveling crane, running the entire length of the building, is in place to facilitate repairs and additions to machinery. In this building, also, is located a large wash and locker room, including toilets, shower baths, steel lockers and numerous other conveniences for the men.

Generator Building.—This building is 60 ft. by 180 ft. in plan, and more than two stories in height, although there is only one floor. A large basement is under the entire building, affording ample storage capacity for fire brick, etc. The walls and floor are constructed of reinforced concrete, and the roof of steel trusses and purlins, which are covered with matched lumber, asbestos felting and composition asbestos shingles. The underside of the roof is thoroughly fireproofed with asbestos protected metal. The outside walls are bush-hammered the same as the other buildings, and the cornice and other sheet metal work are of copper.

The interior finish is also fireproof, being constructed of sheet metal throughout.

This building contains the generators in which the gas is manufactured, three of these machines, 20 ft. in diameter by 30 ft. 6 in. high, having been erected. Three blowers, each having a capacity of delivering 7290 cu. ft. of free air per minute against a pressure of one pound, have been installed, for the purpose of supplying air to oil burners on gas machines. In this building, also, is located the reheating plant, which consists of two machines, each 10 ft. in diameter by 35 ft. high, for the purpose of reheating the gas, which is part of the purifying process.

Briqueting Plant Building.—This is 90 ft. by 110 ft. in plan, and one story in height. The floors are of reinforced concrete, the walls are of heavy wooden columns, filled between with hyrib metal lath and plaster, and the roof is constructed of heavy wooden trusses, sheathing and asbestos felt. The building is also of fireproof construction, practically all of the woodwork being covered with metal lath and plaster, and all windows and door frames metal covered. The outside appearance of the building gives the same

effect as reinforced concrete, and this harmonizes with the remainder of the buildings.

It contains the machinery for manufacturing carbon briquets, which is now the purest fuel that is on the market, being composed of 90 per cent carbon and volatile matters, with only 2 per cent of ash, thus giving the greatest possible amount of heat units with practically no waste. Three large filters, 15 ft. in diameter and 18 ft. in length, each having a capacity of handling 1500 gal. of water per minute, have been installed, together with air, vacuum and water pumps and other secondary machinery. Two cylindrical, revolving dryers, each 75 in. in diameter and 45 ft. in length, have been installed for drying the carbon, after same has been filtered. One briquet press, weighing about 15 tons, has been erected for forming the briquets ready for market.

Briquet Storage Building.—This is 200 ft. by 210 ft. in plan, and one story in height. It also will be used for storing the briquets prior to being sold, and has a capacity of 15,000 tons. The walls are constructed of heavy wooden columns, filled between with hyrib, metal lath and plaster, and the roof of heavy wooden trusses, sheathing and asbestos felt. The building is of semi-fireproof construction, practically all of the woodwork being covered with metal lath and plaster. The general outside appearance of this building also harmonizes with the others.

Oxide and Shavings Storage Building.—This building, 100 ft. by 100 ft. in plan, and practically two stories in height, although it has but one floor, will be used for the storage of shavings and chemicals which are used in the purification of the gas. The floor is made of concrete, and walls, roof, etc., are of the same construction as the briquet storage building.

Pump House.—The pump house is 15 ft. by 35 ft. in plan, and three stories in height. It is constructed mostly below the surface of the ground, as the bottom part is 6 ft. below the mean water level of the river. It is built almost entirely of reinforced concrete, except the facing of the outside walls, which is of hard-burned paving brick. The roof is made up of steel trusses and purlins, wooden sheathing, asbestos felting and composition asbestos shingles. To admit the water from the river to the pumps, a large flume or intake has been built. This intake is 24 ft. deep, 8 ft. wide and 170 ft. long, and constructed of creosoted sheet piling and large timbers.

Two 10-in. centrifugal water pumps, each having a capacity of delivering 2500 gal. of water per minute against a 130-ft. head, have been installed, for the purpose of supplying water to the plant. Provision has been made for the installation of two additional pumps. Two high-pressure oil pumps, each having a capacity of delivering 50 gal. of oil per minute against a pressure of 250 lb., have been installed, and foundation made for one other pump.

Purifiers.—These purifiers are filled with shavings chemically treated, for the purifying of the gas. They are four in number, 32 ft. diameter by 20 ft. high, and of sheet steel, and three additional purifiers of the same dimensions have been moved down from the old plant, and all necessary piping and connections made.

Oil Tank.—One 55,000 barrel steel oil tank, 114 ft. 6 in. in diameter and 30 ft. high, has been provided for the purpose of storing the oil used in the manufacture of the gas.

Tar Tank.—This is a 6000 bbl. steel tank, 42 ft. in diameter and 52 ft. high, and has been erected for the purpose of storing the tar, which is a residual of the gas.

Water Tank.—One 100,000 gal. water tank, with steel tower, has been erected for the purpose of storing the works' water supply.

Piping.—The large mains for conveying the gas are 42 in., 36 in. and 30 in. The water lines are 20 in. and smaller, and the steam and oil 10 in. and smaller. The steam and oil lines are tested for a working pressure of 250 lb., the water lines for 125 lb. and the gas mains for 50 lb. per sq. in.

Capacity.—The plant in general has been designed for an output of 15,000,000 cu. ft. of gas per day, and the buildings have been constructed of sufficient size, and foundations installed to receive this amount of machinery. At present, however, only enough machinery to manufacture 7,500,000 cu. ft. per day is in place.

Streets and Grounds.—An artistic system of concrete sidewalks and curbs has been installed, and the streets are now being paved with reinforced concrete pavement. Numerous lamp posts with gas arcs are being erected along the streets and in dark corners of the grounds. The lawns, which were planted during the summer, are now thriving and add a finish to the entire plant.

LETTERS TO THE EDITOR.

San Francisco, January 27, 1914.

To the Editor:—We note the change which you have instituted in the classified advertising section of your journal, and it appeals to us as being a very satisfactory re-arrangement that will be found convenient for the use of your patrons.

We wish to say that your journal is very much appreciated in our office, as we frequently find articles of very considerable interest to us.

Wishing you the best of success, we are

Yours very truly,

WESTERN PIPE & STEEL CO. OF CAL.,

(Signed) F. B. Kinsman, Secretary.

Portland, Ore., January 10, 1914.

To the Editor:—The Portland Railway, Light & Power Company has been courteous enough in the past to permit our use of their copy of your Journal of Electricity, Power and Gas. This has been a little bit unfair to them and more so to the Journal, and yet, we have suffered most from it because of the hurried attention we have felt obliged to give to the many valued articles appearing.

We wish to change this and wish you would place the name of this association on your mailing list for a year's subscription, dating from the first issue in 1914. Yours very truly,

(Signed) H. C. HAZZARD,

Secretary Pacific Coast Electric Railway Association.

EFFECT OF FORESTS ON RUN-OFF.

By J. C. STEVENS

(Continued.)

Two lines of inquiry will be followed: (1) as to the effect on the total yield of a drainage area; and, (2) as to the effect on uniformity of flow. I have been unable to ascertain the exact claims made by forestry advocates as to the effect of forests on the total yield of a drainage area. In fact, the influence in this particular appears to be charmingly elastic. If forests exist in a humid country, they are said to increase the total run-off. In countries of scanty rainfall, they are said to decrease the total yield. Mr. Pinchot states, in his little book, "The Fight for Conservation," p. 53:

The connection between forests and rivers is like that between father and son. No forests, no rivers.

This, perhaps is not intended as a scientific view of the case, but the impression Mr. Pinchot would convey and the thing he would have the public believe is that forests increase the water supply.

In Bulletin No. 44, Bureau of Forestry, "The Diminished Flow of Rock River in Wisconsin and Illinois and Its Relation to the Surrounding Forests," p. 9, the author says:

On the whole it is safe to say that a larger proportion of the precipitation gets ultimately into the streams from a forest-covered region than from one that is unforested.

Mr. George W. Rafter, Water Supply and Irrigation Paper No. 80, "The Relation of Rainfall to Run-Off," p. 53, makes this statement:

The extent of forestation has probably a considerable effect on the run-off of streams. With similar rainfall, two streams, one in a region having dense primeval forests, the other in a region wholly or partially deforested, will show different run-off. The one with the dense forest will show larger run-off than the stream in the deforested area. In some parts of the state of New York these differences may amount to as much as five or six inches in depth over the entire catchment area.

Mr. James W. Toumey, Yearbook, Department of Agriculture, 1903, p, 287, Collaborator, Bureau of Forestry, says:

In regions characterized by a short wet season and a long dry one, as in southern California and many other portions of the West, present evidence indicates, at least on small mountainous catchment areas, that the forest very materially decreases the total amount of run-off.

The facts are, however, that if the forest has any influence at all, it is to decrease the total run-off in all cases, owing to the greater evaporation, transpiration and storage in the humus. On a watershed where forests have been removed, therefore, we should find a greater yield for the same precipitation.

This conclusion appears to be a rational one, and has in support thereof the well known fact that forests are not found in regions where there is less than 20 inches of rainfall per annum. Nature has made a wise provision in this respect. In well-watered countries the forests grow in profusion and help to diminish the total run-off by their evaporation, transpiration and humus storage. In such cases we are over supplied with water and the forest aids in its dissipation. In region of scanty rainfull, all the water is required and the forests are less luxuriant, or absent, hence a greater part of the precipitation is available for the uses of mankind.

The foregoing apply to the total yield of a watershed only, and must not be construed as applying to the uniformity of flow. On this point the pro-forestry advocates are unanimous in the belief that forests induce greater uniformity of flow. The agencies by which this is said to be accomplished have already been discussed. We will now examine the records themselves.

I submit below practically all the long time records available, of both precipitation and runoff, on watersheds where a change in forest cover has taken place. There are not many examples of this kind. It is admittedly impossible to find out, without great expense, the actual amount of forest changes; nor is it important to know more than that such changes have occurred during the period of record and that they are material changes.

I have expressed the runoff each year as depth of water in inches over the entire drainage area, and the precipitation in the same unit. Divide one by the other and obtain the "runoff per inch of precipitation." It will be found that even under the same surface conditions this quantity will vary from year to year. This variation is due to the variation in amount and distribution of precipitation and to the resultant ground storage. If we start the year with full ground storage, a much larger proportion of that year's precipitation will run off than if the ground storage was depleted at the beginning of the year and had to be replenished. It takes a certain amount of precipitation to produce any runoff at all.

In arid countries large areas frequently receive from six to ten inches of precipitation each year, and yet yield no runoff. There are a multitude of other conditions and factors, and it is obviously impossible to take them all into consideration. We will generally find that the runoff per inch of precipitation will itself increase or decrease with the precipitation, i.e., during wet years a larger proportion runs off than in dry years. In a long series of years, however, these influences tend to balance each other, and if the records include both forested and non-forested period, the effect of forests should be detected.

I have treated all these records in successive periods, inquiring first as to the change in the total quantity of runoff, and second as to the uniformity of flow.

Tennessee River Basin.

The records of discharge have been compiled from gauge readings kept at Chattanooga, Tenn., by the U. S. Army Engineers. Discharge measurements have been made by the U. S. Geological Survey, by which these gauge readings are translated into mean discharges for each day of the year. The precipitation data is taken from records of the U. S. Weather Bureau.

The record covers 35 years, from 1874 to 1908. The most active lumber operations in the upper portion of the drainage basin have been carried on during the past 20 years. Before the seventies the forested areas in the mountainous regions were practically the same as before the advent of white settlers. Since the beginning of the record, about 25 per cent of the forests on the drainage area have been

removed. The total drainage above Chattanooga is 21,400 square miles, of which about 60 per cent is still in forest, some of which has been partially culled for certain species, and over which have run fires of more or less severity since the country was first settled. (These data taken from Professional Memoirs Engineer Bureau U. S. Army, Vol. 1, No. 4, p. 389, and Professional Paper U. S. Geological Survey No. 72.)

I have chosen this stream because the records are reliable and because they have been used extensively by pro-forestry advocates as an example of the "calamities" that inevitably follow the "ruthless" destruction of our forests. According to Leighton, (Water Supply paper No. 234, p. 23), the effect of deforestation on the runoff of this stream has been to increase the flood severity and flood frequency 18.75 per cent since 1884. In my analysis I have used the identical figures for precipitation and discharge used by Mr. Leighton.

The following table gives the essential facts in regard to the runoff from this watershed. The entire interval of record has been divided into four periods, and the figures given are the averages for these periods as shown.

Tennessee River, at Chattanooga, Tenn.
(Drainage Area, 21,400 Square Miles.)

Period.	Precipitation. (inches)	Runoff. (inches)	Runoff per in. of precipitation. (inches)	Maximum discharge. (sec. ft.)	Minimum discharge. (sec. ft.)	Uniformity Ratio
1st 9 years—						
1874-1882..	58.1	26.5	.45	221,000	7,960	.036
2d 9 years—						
1883-1891..	51.7	27.4	.53	242,000	8,660	.036
3d 9 years—						
1892-1900..	48.8	22.6	.46	218.000	8,950	.041
4th 8 years—						
1901-1908..	49.9	24.5	.49	191,000	9,990	.052

The Tennessee basin is decidedly a humid region, and if the current forestry theories are correct, we should expect to find a material decrease in the runoff per inch of precipitation separate and apart from that which would naturally follow the decrease in rainfall during the period. The rainfall records are not nearly as accurate as those of runoff and too much significance must not be attached to them, especially the earlier records. Apparently the runoff per inch was least when the rainfall was greatest (1st period) and the area of forest cover was also greatest. This apparent result while directly contradictory to the popular forestry theory, is doubtless due to inaccuracies in the precipitation records and we should not attach significance to it. Beginning with the second period we see that with a decreasing rainfall the runoff per inch also decreases as before pointed out. The forestry theory would lead us to believe that this quantity should increase with a decrease in the forest covered area, but such is not the case.

Fig. 1 shows the precipitation, runoff, and runoff per inch of precipitation plotted for each year, together with the averages by periods, as given in the table. The general parallelism of these hydrographs is striking. It proves conclusively that variations in runoff are produced by variations in precipitation, and that if any other influence exists it is of no moment.

Inquiring next as to the uniformity of flow, the last three columns in the above table furnish interesting data on this point. The forestry theory teaches that forests induce lower high-waters and higher low-waters than would obtain without them. Column five gives the average maximum yearly discharge, and column six gives the average minimum yearly dis-

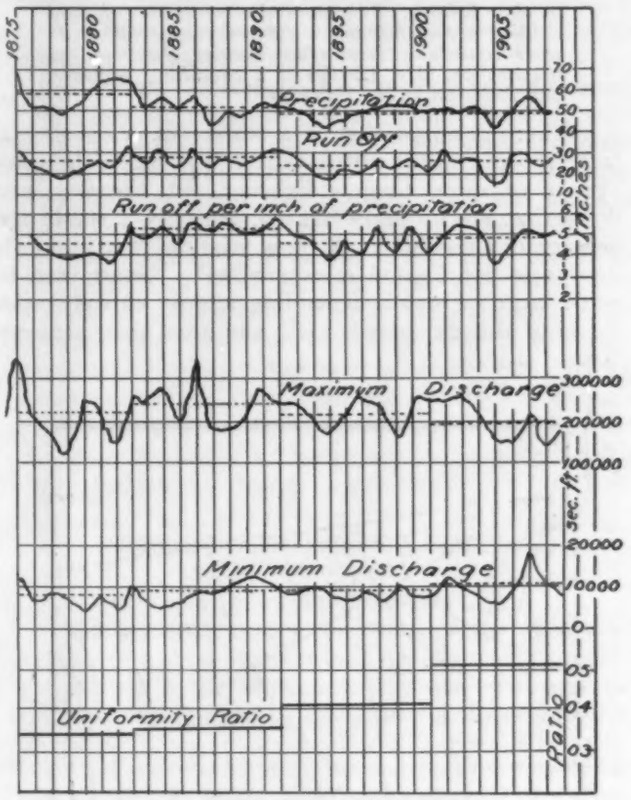


Fig. 1. Tennessee River Chart.

charge, for each period. Column seven is obtained by dividing the minimum by the maximum, and is a measure of the uniformity of flow. It is therefore called the "uniformity ratio." A stream whose flow was the same every day (if such were possible) would have a uniformity ratio of 1.00, while a stream that went entirely dry would have zero as a uniformity ratio. Hence the larger this ratio, the more uniform the flow.

It is seen that this ratio has persistently increased coincident with a reduction in the forest area on the watershed. This directly controverts the forestry theory. On this stream flood lights are substantially lower, and low water flow materially higher, than when its drainage area was heavily forested. However, the cause must be looked for entirely outside of forestry effects.

This system of analysis does not take full account of the moderate freshets—only the maximums each year being considered. To make a proper study of this feature involves an enormous amount of labor, since daily records of discharge and precipitation would have to be critically analyzed and each freshet expressed in terms of the rain that produced it. This will involve also an arbitrary assumption of what constitutes a freshet, different assumptions as to this quantity yielding entirely different results.

[To be continued.]

LIGHTING METHODS

SHOW WINDOW LIGHTING.

BY CHARLES T. PHILLIPS.

(There is much room for improvement in store window lighting. Fundamental requirements of good lighting are stated and a different viewpoint as to what constitutes in window lighting the plane of illumination. Mr. Phillips is a consulting engineer, San Francisco.—The Editors.)

There is no portion of a store that will bring as large returns on the investment as a properly designed system of show window lighting, yet, the few windows that are properly lighted, are only a small percentage of the whole. A show window that is poorly lighted is not a good sales medium. Results can be made large or small, depending almost entirely upon the kind of light sources used, and upon their arrangement. The problem of proper lighting has two sides, first the physical, or method of producing the light, and second, the psychological, or the effect of the lighting on the observer. The systems which are frequently used may be condemned from either side. A show window that is lighted with exposed light sources of high intrinsic brilliancy will be condemned for the psychological effect, although there might be sufficient light of proper quality. The show windows are to sell goods and not the electric lights and fixtures, but, if the latter are exposed to view, the observer's attention is attracted from the window display to the light sources.

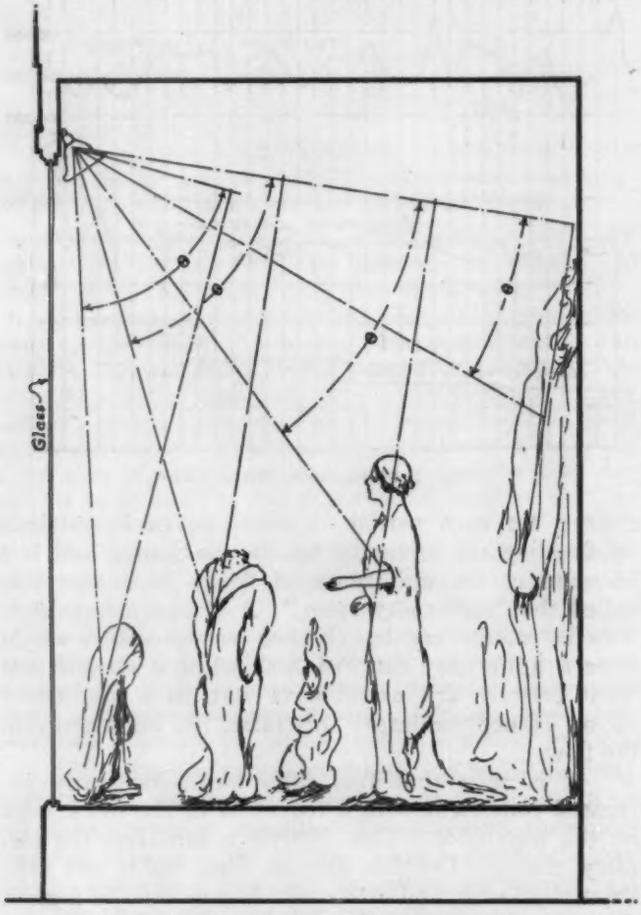


Fig. 1. Showing Vertical Illumination Required.

Illumination can be briefly defined as the effect of light, light being the cause and illumination the result. We must consider then, not only the light sources themselves, but also the resultant illumination.

The proper lighting of a show window depends upon the style, character of the goods displayed and the effect desired.

The best authorities on show window lighting agree that the light sources should not be exposed, but that the window should be treated the same as a stage in a theater. The goods displayed should be well lighted by concealed lights and it is best to have the side walls and ceiling finished in light tones. White or ivory, with a matt surface, is perhaps the best, especially if the display is in dark colors. It is almost impossible to light a show window satisfactorily in which the walls and ceiling are finished in mahogany or painted in dark colors.

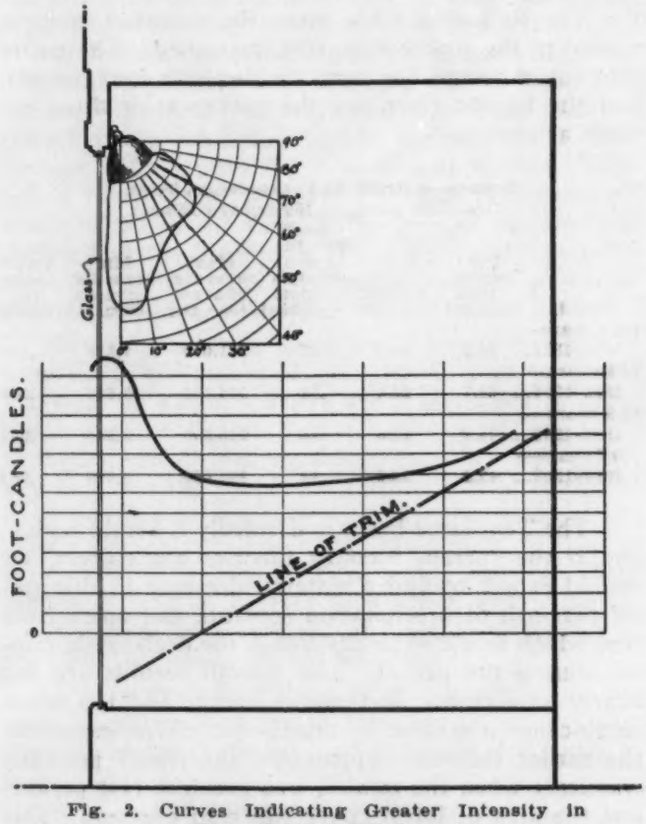


Fig. 2. Curves Indicating Greater Intensity in Front Part of Windows.

In order to see a window display clearly and easily, without eye strain, the following considerations must prevail: There must be sufficient illumination; that is, enough light must be reflected from the objects displayed to the eye. For this reason, much more light must be thrown on a dark display than on a light one, the co-efficient of reflection of the dark objects being much less than that of light ones. Too much

light must be avoided. The iris of the eye can contract only to a certain extent and is soon fatigued by a strong light. As the iris weakens, it expands, allowing the strong light to strike the retina, producing eye strain. If this is continued the eye may be permanently weakened. Bright lights in the field of vision should be avoided, as the picture of the light source itself will be formed on the retina of the eye and other objects will seem dim in comparison. The lamps should be placed so that the light is not regularly reflected to the eye. Light which consists largely of a predominating color is undesirable, as the color value of objects illuminated is thereby changed.

The intensity required for show window lighting depends upon the location of the window (whether in a brilliantly lighted street or in some street where the lighting is not so good) whether or not the adjoining windows are well lighted, the kind of display and the class of trade to which the merchant caters.

There is perhaps more waste in the illumination of show windows than in any other department of a store. If the same loss occurred proportionately in other departments, it would mean quick bankruptcy. A merchant may display phenomenal intelligence in other matters, yet, in selecting a system of illumination which is supposed to be a permanent investment, he will disregard absolutely every law pertaining to the subject, and then be surprised that the installation is not satisfactory. If he should be satisfied with the light, there is still the chance that the installation will be expensive and the monthly bill high. He may appreciate the fact that salesmanship is a science and that it is necessary to have a high grade department manager for each particular line, but, the fact that illumination is a science and that high efficiency is obtained by the application of scientific knowledge, does not seem to be appreciated by him.

Perhaps the most common error in show window lighting is where a satisfactory installation is copied from another window where the conditions are radically different. An argument frequently brought forth is that a certain make of reflector is being used or that the reflector is of first class material, or that such and such a store is using them. Whether or not the design is particularly adapted to the case at hand, seems to bear very little weight. The loss in efficiency or undesirable results may be more a matter of the type of reflector used than of any other item. A high grade reflector may be used, and the installation even then prove ineffective.

We frequently hear it said of a badly designed installation that it is giving satisfaction. It may do so to a certain extent, but it would seem that if it gave the same satisfaction for less money, or better results for the same money, it would be more in keeping with modern business methods.

The general opinion seems to be that to get the best results in illuminating a show window, an imaginary plane, called the line of trim, should be evenly illuminated. This may seem to be the proper method, but it must be conceded that very rarely is the display so arranged that this will obtain the maximum results. A jewelry, and, possibly, a shoe display may be so arranged that this method will give satisfaction, but for clothing, dry goods, furnishings, etc., the results will not be good.

Surface brightness should be the criterion of sufficient illumination. With an even intensity on the line of trim, objects in the foreground will not be as well lighted as those in the background.

The surface to be illuminated does not lie in the same plane as the line of trim, as usually shown, but more in a vertical plane. This is clearly shown by Fig. 1. The writer has obtained excellent results by increasing the intensity materially at the front of the window, as shown by Fig. 2.

Economy of current consumption is not the only really important consideration, though there are many engaged in various branches of the electric lighting industry who take that view. Their arguments to the consumer are often based solely upon the proposed reduction in the monthly electric bill and not often enough upon improvements in lighting conditions. The complaint from the consumer, may be that the current bills are too high for the amount and quality of light but, what the consumer usually desires, is more illumination rather than a smaller bill. In fact, experience shows that when the quality and quantity of the illumination has been increased, the merchant is apt to increase his energy bill by keeping the windows lighted for longer hours.

METHOD IN HOME LIGHTING.

[Continued.]

6. Dining Room.

Dining room and dome seem almost inseparable and to pry them apart would necessitate a complete knowledge of the arrangement of the room in which the installation is to be made and of the tastes of the owner.

In a room with dark decorations the bright light thrown on the table from the average dome fixture equipped with high efficiency Mazda lamps is altogether too brilliant. If the dome is suspended at a mounting height which allows the light to cover nicely the family table, the effect is too spotty when the table is lengthened, while to use the common type of dome fixture at a mounting height sufficient for the extended table to be evenly illuminated, is to usually bring the bare lamps within the range of vision. It is practically impossible to properly illuminate a long table with one center dome fixture.

In correct practice, dining room dome fixtures should be equipped with a translucent reflector of light density opal glass, rough inside and rough outside (a velvet finish prismatic reflector would also be suitable), and a bowl frosted Mazda lamp of comparatively low wattage. It is sometimes advisable, and at others as a matter of taste, to fit a diffusing screen of either silk or glass in the opening of the dome so that the light on the table is more diffuse and mellow. This screen would also serve to subdue the light falling directly on the eye where necessity compels suspension of the dome at greater than the regular height above the table.

There are still those people who prefer to dine by candle-light, because it is so soft and pleasant, but there is no reason why electric light should not prove equally effective. It is certainly safer.

To relieve the darkness of the upper walls and ceilings, emphasized by the localization of the light on the table, round bulb low wattage totally obscured

(frosted) lamps are sometimes installed around the canopy of the dome, or on beamed ceilings, at the intersection of beams.

With such lighting, important pictures should be illuminated, though to a low intensity, with localized lighting, opaque reflectors reflecting the light diffusely being used for that purpose.

A floor outlet should be provided to allow the installation of decorative lamps. This would permit the use, on the table, of an electric percolator, toaster, etc., as well.

Shower fixtures with carefully selected glassware are also in order. It is then advantageous to provide buffet fixtures or sidewall brackets. The glassware then used should be very mellow, such as Tiffany ware, or of very heavy density, seeing that these bracket lights are sure to, at some time, come within the range of vision.

Indirect lighting is very well suited to this purpose, but in rooms with beamed ceilings the heavy shadows cast are an objectionable feature. The dark beams absorb quite a lot of light.

Where indirect lighting is used and a multiple light fixture makes this arrangement possible, a three-way switch should be installed so as to permit the use of a low or greater intensity of illumination at will, one lamp, perhaps, being first switched on and then two or more added.

A further suggestion with regard to cheap, unsightly, and unscientific fixtures. It is far better not to buy them, but to rather secure a few good fixtures and use drop cords as make-shifts until the high-class fixture can be purchased.

One room in which an agreeable temporary economy may be effected is the dining room.

A round or many-sided light-weight though stiff wire frame should be secured, care being taken that it can be fitted to the drop cord socket in such manner that the silk with which it is covered does not touch the lamp. The frame should be not less than 24 in. in diameter and further insurance from scorching and a better effect can be secured if a reflector is also used similar to that recommended for use with the regular dome. A frill of the same material as that used for the cover, and sometimes the use of heavy lace around the edge also, will in the hands of the deft housewife make a very pleasant substitute fixture.

There is a tendency to immediately choose a very deep red for this purpose, but unless the reflector is also used this should be avoided, as that color absorbs so much light. Otherwise a light amber color is very pretty and serviceable, though there are many others as good. With a little forethought as to the proper combination of white cloth, shade, flowers and silverware, this temporary makeshift may be made both serviceable and pleasing.

The main object sought in dining room lighting is to flood the table with a mellow light and in such manner that it will also illuminate the faces of diners to advantage, be so restful and harmonious that without being conscious of the equipment the effect of the lighting will be pleasing and so contribute to an enjoyable meal.

7. The Den.

Here is one room in which economy of current consumption on account of the small area to be lighted, Where indirect lighting is used a multiple light is unimportant. It depends however upon the exact use to which the room is to be put whether a combination of local and general illumination should be used or of general illumination only. In either case, indirect lighting is, in the main, to be preferred.

Intensities should be sufficient for easy reading or writing.

[To be continued.]

CENSUS FIGURES ON ELECTRIC LIGHT AND POWER.

Preliminary figures of the forthcoming quinquennial report on the central electric light and power stations of the state of Utah have been given out by Director W. J. Harris of the Bureau of the Census, Department of Commerce. They were prepared under the supervision of W. M. Steuart, chief statistician for manufactures.

The statistics relate to the years ending December 31 for 1912 and 1907, and June 30 for 1902, and cover both commercial and municipal electric plants. They do not include electric plants operated by mining companies, factories, hotels, etc., which consume the current generated, those operated by the Federal Government, and state institutions, or plants that were idle or in course of construction.

The figures as presented for Utah show that during the decade 1902-1912 there were general gains in the industry. The number of commercial establishments in the state increased from 15 in 1902 to 28 in 1912, a gain of 87 per cent. The total income was $1,516,410 in 1912 as compared with $714,353 in 1902, a gain of 112 per cent. The total expenses increased 99 per cent—from $607,769 in 1902 to $1,206,729 in 1912. The total horsepower developed from water wheels showed a gain of 224 per cent, or from 18,410 in 1902 to 59,588 in 1912. That the arc lamp is being superseded in Utah by the incandescent and other varieties is shown by the decrease of 77 per cent in the number of arc lamps reported as wired for service, and the increase of 63.2 per cent in all other varieties.

The figures are shown in detail in the accompanying table:

Utah.	1912	1907	1902	Per cent of increase [1] 1902-1912.
Number of establishments	45	31	16	181.2
Commercial	28	22	15	86.7
Municipal	17	9	1	.....
Income	$1,516,410	$665,241	$714,353	112.3
Light, heat and power	$1,497,205	$627,332	$664,240	125.4
All other sources	$19,205	$37,909	$50,113	—61.7
Total expenses, including salaries and wages	$1,206,729	$461,675	$607,769	98.6
Total number of persons employed	401	198	240	67.1
Total horsepower	60,588	35,950	20,460	196.1
Steam and gas engines (including turbines):				
Number	6	10	9	—33.3
Horsepower	1,000	1,279	2,050	—51.2
Water wheels:				
Number	63	45	26	142.3
Horsepower	59,588	34,671	18,410	223.7
Kw. capacity of dynamos.	37,935	33,592	13,923	172.5
Output of stations, kw.-hr.	86,634,658	61,672,661	32,457,063	166.9
Estimated number of lamps wired for service:				
Arc	333	[2] 440	1,469	—77.3
All other varieties	150,380	[2] 67,670	92,165	63.2
Stationary motors served:				
Number	1,044	406	295	253.9
Horsepower capacity	37,490	5,519	5,868	538.9

[1] A minus sign (—) denotes decrease.

[2] Exclusive of 7 arc and 1,929 lamps of other varieties reported by the electric companies as used to light their own properties. Lamps used for such service were included in the number reported for 1912.

SAFETY FIRST CONFERENCE AT RENO

One of the most unique and interesting meetings ever held in a western state was the "Safety First" Conference at Reno, on January 26 and 27th. It was unique because probably the first instance in the country where a movement arousing such state-wide interest was inaugurated and carried to a successful conclusion by state officials,—in this case the State Industrial Commission of Nevada and the Mechanical and Electrical Department and Engineers' Club of the University of Nevada. The meeting was interesting in that it brought together mine managers and miners, railroad officials and trainmen, manufacturers' representatives, power plant superintendents and operators, members of the university faculty and students, state officials, labor representatives, engineers and professional men —the total attendance being six hundred. It was productive of lasting benefit in that it focused the attention of the entire state on the "Safety First" movement, leaving as a record valuable papers and discussions.

The conference opened Monday afternoon in the University gymnasium with W. E. Wallace of the Brotherhood of Railroad Trainmen and State Industrial Commissioner, and Professor James G. Scrugham as presiding officers. The following papers were presented at this session:

"The 'Safety First' Movement in Nevada," by John J. Mullin, secretary Nevada Industrial Commission, in which he described the organization of the commission and dwelt on its future work and the co-operation between employer and employe that was necessary to make the movement a success.

L. E. Abbott, safety commissioner of the Oregon Short Line, gave a very interesting account of " 'Safety First' on the Oregon Short Line," showing with what enthusiasm the work had been taken up and what splendid results in the saving of life and limb had been accomplished on that railroad system.

" 'Safety First' in Practice" was handled by Frank Ingram, secretary Brotherhood of Locomotive Firemen and Engineers. Mr. Ingram discussed some of the safety precautions that had been inaugurated by the employes of the railroads in the state, dwelling principally on the law which the trainmen had succeeded in placing on the statutes of Nevada requiring locomotives to be equipped with 1500 candlepower arc headlights.

J. H. Linn of Topeka, Kansas, gave a short description of the safety work on the Santa Fe System and followed with a very interesting paper on the Student apprentice system of the Santa Fe with which work he is connected as assistant chief instructor.

J. M. Guild, secretary of the Bureau of Safety of the Union Pacific, followed with a short description of the work on that road.

Professor H. P. Boardman, head of the Civil Engineering Department of the University of Nevada, gave some very interesting remarks on "Safety First in Civil Engineering." He showed how necessary it was in designing structures to use proper safety factors, citing the Quebec bridge failure as an example where all the necessary precautions had not been taken. Two conclusions drawn from this failure were that a structure which might be satisfactory and safe on a small scale might not be safe when constructed in a similar manner on a much larger scale—also that certain members of a structure may be subjected to greater strains during erection than after completion, thus necessitating corresponding greater strength. He also touched on the necessity of automobile drivers exercising more "safety first" precautions.

A paper entitled "The Prevention of Accidents," by C. W. Price, safety engineer, Wisconsin Industrial Commission, was read by the secretary, Mr. Price not being present. The paper described some of the remarkable results that have been obtained among eastern corporations and then gave in detail the necessary steps to be followed in introducing a "Safety First" movement in an industrial organization.

Monday evening was given up to wireless telegraphy and discharges of high potential electricity, the demonstration being made by the Department of Electrical Engineering and Physics of the University, followed by motion pictures of "Safety First" on the Union Pacific; The Manufacture of Steel, loaned by the U. S. Steel Corporation; University of Nevada Campus and Laboratory Views, and National Mine Rescue Demonstrations loaned by the U. S. Bureau of Mines.

Owing to the severe storm of the 25th and 26th many of the delegates were delayed in reaching Reno, so the electrical papers were held over until Tuesday. On the morning of that day a very interesting meeting was held of railway apprentice instructors of the Southern Pacific, Santa Fe, Oregon Short Line and Union Pacific. The meeting was presided over by Norman Collyer, executive secretary to the president of the Southern Pacific Company, and papers were presented by Hon. John Edwards Bray, Nevada State Superintendent Public Instruction. Thos. G. Gray of the Sacramento and H. S. Gillette of the West Oakland shops of the Southern Pacific; Mr. Linn of the Santa Fe and A. W. Preston, shop superintendent of the University of Nevada. On the preceding day, Mr. Collyer had addressed the engineering students of the university on the apprentice system for college men in operation on the Southern Pacific System.

At the electrical section of the conference on Tuesday morning at which A. H. Babcock, electrical engineer of the Southern Pacific presided, a very interesting discussion was held on "Safety Regulations for Electric Power Companies," the leading paper being by W. K. Freudenberger, chief engineer of the Nevada State Public Service Commission.

The principal session of the conference was the general meeting on Tuesday afternoon at which Governor Tasker L. Oddie presided. At this session chief interest centered in the discussion on electric headlights which was introduced in a valuable paper by J. G. Scrugham, professor electrical and mechanical engineering of the University of Nevada. This paper and discussion and a mention of the tests conducted at the close of the conference are presented elsewhere in this issue.

Following the headlight discussion, after a demonstration of the talking arc, the following papers were presented:

" 'Safety First' in Mining," by Thos. M. Fagan, president of Tonopah Miners' Union, in which he discussed in an eloquent manner the relation of the employe who sells his labor, to the employer and the state, dwelling particularly on features of the Nevada Insurance and Compensation Act.

" 'Safety First' at Nevada Consolidated Copper Company's Plant," by Lindsay Duncan, mechanical engineer of that company, was read by title in the author's absence.

Edward Ryan, state mine inspector, gave a very interesting paper on "Accident Prevention in Mining," dwelling particularly on the necessity of educating employes to their own dangers. At the close of his talk Mr. Ryan demonstrated the miners' oxygen helmet and rescue outfit, and the pulmotor, all of which are endorsed by the U. S. Bureau of Mines.

A. W. Hunsinger of the Goldfield Miners' Union, spoke of accident prevention and was followed by Rev. Lloyd B. Thomas, Carson City, Nevada, who gave his impressions as a visitor at the Safety Conference held under the auspices of the American Museum of Safety in New York, December 10-12, 1913.

At the close of the meeting a communication from Secretary Cameron of the National Council for Industrial Safety urging the formation of a local council in Nevada to co-operate with the National body, was read by C. W. Whitney. On motion of John J. Mullin, secretary of the Nevada Industrial Commission, a resolution was passed by the convention to the effect that it was the sense of the conference that an organ-

ization be formed to carry on the industrial safety work in Nevada and that Governor Oddie appoint a committee of nine of which he constitute the chairman to arrange for and perfect such an organization.

The conference proper closed with a banquet given by the Engineers' Club of the University to the delegates and guests. Regent A. A. Codd of the University presided as toastmaster and the speakers of the evening included Governor Oddie; W. S. Lunsford, city attorney, and Reno Typographical Union; Hon. P. A. McCarran, Justice Supreme Court; R. J. Clancy, assistant general manager Southern Pacific Railway; J. B. Brennan, representing the Blacksmith's Union; J. H. Linn of the Santa Fe, and Dr. J. E. Stubbs, president of the University of Nevada. Mr. Clancy's remarks were particularly interesting to the technical and railroad men present as they covered a wide range of the Southern Pacific's activities touching on the historical side and closing with the live subject of electric headlights.

Of the exhibits at the conference the principal one was that of the Southern Pacific Company, which reproduced the exhibit booth that was shown at the International Exposition of Safety and Sanitation held in New York City in December, at which time the company was awarded the Harriman Medal for the best safety record of all railways in the United States during 1913. The exhibit was in charge of John C. Weigandt, assistant chief clerk to Julius Krutschnitt, chairman executive committee Southern Pacific Company. Another very interesting exhibit was an electrically operated working model of the block signal system used on the Southern Pacific. The University of Nevada exhibited a small locomotive and gas engine and generator, constructed in the University shops, also a comprehensive display of "safety first" literature.

Much of the credit for the success of the conference is due to Professor Scrugham who conceived the idea of the meeting and arranged practically all its details, carrying it through with honor to himself, the University and the State.

ELECTRIC HEADLIGHTS.

BY J. G. SCRUGHAM.

Since the safety of the traveling public and of men engaged in the transportation industry is in a certain measure dependent upon the use of a proper headlight for cars or locomotives, it seems proper to discuss this important subject at an Industrial Safety Conference. Twenty-eight states have adopted legislation embodying seventeen different specifications regarding the use of headlights on locomotives. The enlightened state of Georgia requires a 300 watt arc lamp with a 23 in. reflector, while in the adjacent state of Mississippi, an 18 in. reflector is deemed necessary. In South Carolina the light must measure 10,000 candlepower with a reflector. Nebraska requires a light that is sufficiently strong to distinguish an object the size of a man at a distance of 600 ft. (Whether the man is to be a white man or a black man, dressed in white or black clothes, etc., is not specified.) In five states a similar law is enacted in which the distance is set at 800 ft. In Iowa it is made to specify discernment of a man lying down at a distance of 1100 ft. Several states require a light of 1500 candlepower without a reflector, while Missouri requires 1500 candlepower with the reflector. It will be noted that many of the above laws are of a conflicting character, especially as the strongest practicable headlight manufactured at present delivers less than 1000 mean spherical candlepower without a reflector.

What the traveling public, railroad management, and employes all want is that light which is most conducive to the safe operation of trains. The problem is how to obtain it. The efficiency of a headlight is primarily dependent on the reflector or lens used, and, secondarily on the volume or power of the light itself. The reflector may multiply the horizontal candlepower of the head lamp anywhere from unity to 2000 times or more, depending upon the condition of reflector and the focus used. For example, a 500 horizontal candlepower arc with a dirty, ill focused reflector, may give only a very few thousand candlepower ahead on the track, while a well designed 100 candlepower incandescent, with a properly focused reflector is capable of delivering nearly a quarter of a million candlepower where it is needed. To obtain efficient results it is necessary for the light source to be well concentrated and placed at what is known as the focal point of the reflector. The complaint about poor headlights arises as much from the improper condition of the reflector and focusing, as from the insufficiency of the light itself. There seems to be an almost unanimous opinion that the light reflected ahead should be of sufficient volume to enable the engineer to discern any serious obstruction or fault on the track in time to prevent or minimize the danger of an accident. This means that the object must become visible at a distance of from 500 to 1000 ft. under ordinary operating conditions. Another requirement is that the light should not be so strong and dazzling as to blind observers or approaching enginemen. A very powerful arc, especially those rich in greenish rays, should be avoided because of the tendency to give a false color to the red danger signals and the injury to the eyes of those looking into its field.

The light should be uniform, reliable, and easily replaced or repaired in case of failure. Our problem is to determine which light most nearly fulfills these conditions. In recent years the unit, called the candlepower, has been practically abandoned by illumination engineers and lamp manufacturers on account of its ambiguity. The most definite and useful unit is called the foot candle, and is a measure of the illumination on the objects to be made visible, instead of being a measure of the light source itself. To those having normal vision, an illumination of one-tenth of a candle-foot thrown from a headlight on a dark object the size of a man renders it distinctly visible at a distance of a thousand feet or more under ordinary conditions. A man wearing white clothes can be discerned at twice this distance. If he wears some glittering jewelry, as in one case which came under my observation, he can be spotted more than half a mile away. However, all trials should be based on discernment of dark objects, as the average trespasser on the right of way is rarely so accommodating as to display his jewelry to the engineer on the approaching train.

Illumination such as I have just described can readily be obtained from a concentrated filament lamp of 100 spherical candlepower if a well silvered parabolic reflector is used. In my opinion any stronger illumination is a waste of light. In foggy weather or when the air is filled with snow flakes, the lower candlepower lamp again has the advantage as the rays are more penetrating than those of the higher candlepower light. These latter are reflected back toward the observer. It is only within the past few months that a satisfactory incandescent lamp has been devel-

oped for headlight purposes. The old carbon filament lamp and the earlier forms of tungsten lamp were of such nature that the light source could not be sufficiently concentrated to give good results with a parabolic reflector. However, the development of the wire drawn helix filament tungsten lamp surrounded by nitrogen gas seems to have solved the problem. When a lamp is so constructed that practically all of the light source can be placed at the focal point, the illuminating efficiency is vastly higher than when the light covers a large area. For this reason a low candlepower lamp can frequently reflect a better light on the track than the large arc. The big headlight manufacturing concerns, such as the Pyle, Remy, and others, who formerly specialized in arcs are now building turbo-generator sets to accommodate the rapidly increasing demand for the incandescent light. The advantages of giving no fumes to blacken or tarnish a reflector and requiring no elaborate mechanism for adjustment is obvious to all. I hold no brief for any particular make or type of generating apparatus. The point I do wish to make is that a five hundred or a five thousand candlepower light is of very little use in preserving the lives of the traveling public unless it is properly reflected and directed to where it is needed. Another thing worthy of consideration is the location of the light on the front of the engine.

For many reasons it would be a marked advantage to have the headlight located lower down on the front of the boiler than is the present practice. I was formerly a very warm advocate of such a change, but after observing the ultra-coarse methods used by an Austrian helper in opening up a smoke box door with a sledge hammer, the desirability of the present headlight location became obvious.

Reverting to the subject of headlight legislation again. While the startling originality of the ideas of some of the bill framers might be deemed commendable, yet the question is obviously one that should receive the attention of some competent Federal Commission empowered to make recommendations to congress. Such a commission should consist of a number of locomotive engineers and other qualified experts who would determine what degree of illumination on an object expressed in foot candles is required for the engineer with normal vision to sight a man in dark clothes at various specified distances. All legislation should be based on such accurate and reliable information instead of in haphazard manner as at present.

Record of Tests.

The following summary of distance tests made with headlights, February 5, 1913:

In these tests the persons on the track were dressed in dark clothes. The column headed "as an obstacle" shows distance persons were visible as an obstruction of some kind on the track. The column headed "counted" shows distance when the number of persons on the track could be counted from the cab or discerned as a person.

Acetylene Standing Test.

Date	No. of men on track	As obstacle	Counted Ft.	Remarks.
7-26-11	1	799		
"	1		524	
"	1		734	
"	1		681	
"	1		563	
"	1		642	
	Average	799	642	
10-25-10	4	742		Commercial Acetylene Co. gas and reflector
"	4	768		
"	4	787		
"	1	831		
"	1	697		
	Average	765		
9 - 2-10	5	449		Commercial Acetylene gas and reflector.
"	5	481		
"	1	441		
	Average	457		
9 - 2-10	6	513		Commercial Acetylene reflector and S. P. generator.
"	6	597		
"	1	469		
	Average	526		
9 - 2-10	4	637		Commercial Acetylene reflector, S. P. Co.
"	4	645		
"	4	725		
"	4	705		
	Average	692		
9 - 2-10	5	637		Commercial Acetylene Co. reflector and S. P. generator.
"	1	661		Commercial Acetylene Co. gas and S. P. Co. reflector.
"	4	773		
"	4	773		
	Average	736		

Acetylene Running Test.

10-25-10	4	601		Commercial Acetylene Co. 6-in. reflector.
"	4	653		Commercial Acetylene Co. 6-in. reflector.
	Average	627		

Electric Incandescent, Standing Tests.

7 - 8-12	2	1057		Mazda light from General Electric Co.
"	1	1030		Mazda light from General Electric Co.
"	1	1030		Mazda light from General Electric Co.
"	2		960	Mazda light from General Electric Co.
"	3		960	Mazda light from General Electric Co.
"	3		960	Mazda light from General Electric Co.
9-11-12	2	674		Westinghouse zigzag filament.
"	2	674		Westinghouse zigzag filament.
"	2	674		Westinghouse zigzag filament.
"	1		590	Westinghouse zigzag filament.
"	2		640	Westinghouse zigzag filament.
9-11-12	2	780		Westinghouse U-shaped filament.
"	3	705		Westinghouse U-shaped filament.
"	1		690	Westinghouse U-shaped filament.

Running Tests.

7 - 8-12	2	990		Mazda light from General Electric Company.
"	1	852		Mazda light from General Electric Company.
9-11-12	3	621		Westinghouse zigzag filament.
"	2	780		Westinghouse zigzag filament.
"	1		690	Westinghouse zigzag filament.
"	3	705		Westinghouse zigzag filament.

Electric Arc, Standing Test.

Date.	No. of men on track visible as obstacles.	No. of men on track counted.	Distance, ft. No. 1.	Distance, ft. No. 2.	Remarks.
8 - 2-12		1	1067	1217	No. 1 Lacy light.
"		1	1109	1137	No. 2 Pyle light.
"		1	1148	1073	
		Average	1108	1142	
8 - 2-12	1		1608	1617	
"	1		1568	1561	
"	1			1601	
		Average	1588	1593	

Date.	No. of men.	As obstacle.	Counted.	Remarks.
8 - 2-11	1	1420		Lacy headlight.
"	1	871		Lacy headlight.
	Average	1146		Lacy headlight.
8 - 2-11	1	1041		Pyle headlight.
"	2	1169		Pyle headlight.
	Average	1105		

The last two tests are electric arc running tests.

Summary.	Feet.
Acetylene standing test	653
Acetylene running test	621
Acetylene, all tests	650
Electric arc standing test	1281
Electric arc running test	1125
Electric incandescent, General Electric Co. Standing test	1000
Electric incandescent, General Electric Co., running test	921
Electric incandescent, Westinghouse zigzag filament, standing test	650
Electric incandescent, Westinghouse zigzag filament, running test	621
Electric incandescent, Westinghouse U-shaped filament, standing test	725
Electric incandescent, Westinghouse U-shaped filament, running test	725

In test of Westinghouse incandescent the zigzag filament light tested had been in service 55 hours of light; the U-shaped filament tried was new.

Relative to oil light, we have no tests made under the same conditions as above.

A test made at Benali in 1907 noting the distance another engine (without lights) could be seen gave the relative distances for oil and acetylene as 1 to 2.18.

On this basis one or more people would be visible on the track with an oil light at a distance of 300 ft.

General comparison as follows using the standing test and in the incandescent light the higher candlepower, General Electric only:

	Feet.	Relative distance.
Oil light	300	1.00
Acetylene	653	2.18
Electric incandescent	1000	3.33
Electric arc	1281	4.27

Engine 3017—Aug. 8, 1913.

This lamp is a General Electric Incandescent Tungsten having nitrogen in bulb. It is operated by Exide Storage batteries made by Electric Storage Battery Company, Philadelphia, Pennsylvania.

Batteries arranged 2 sets in multiple 4 batteries in series in each set, a rheostat is used and the circuit shows 8 volts and 12 amperes, 6 volts across the lamp which consumes 72 watts and is rated at about 100 candlepower.

Test was made of light on Sacramento Southern on morning of August 7th, between hours of 1 and 3:30 a. m. Night clear and dark; moon absent; men on track dressed in dark clothes.

Globe tested had been in service approximately 5 hours, light being applied at Oakland August 6th for run Oakland to Sacramento, train No. 16.

Result of distance tests as follows:

Men on Track Discerned as Object or Obstruction of Some Kind.

No. of test.	No. of men on track.	Distance, ft.
1	3	1099
2	3	993
3	3	1079
	Average	1057
	No. of men on track counted.	
1	1	857
2	2	751
3	1	917
	Average	842

Running Test—Engineer and Fireman Only Taking Part—Distance Men on Track Discovered as an Object or Obstruction of Some Kind.

No. of test.	No. of men on track.	Distance, ft.
1	3	791
2	2	766
3	2	1038
	Average	865

Pyle National Incandescent Headlight—November 15, 1913.

This generator (Type "S" Turbo-Generator Unit) has been installed for trial on engine No. 2328, furnishing current for a 20 watt 32 volt Westinghouse Mazda incandescent headlight lamp.

Roundhouse Test of Type "S" Generator.

Test.	Steam pressure.	Revs.	Volts.	Headlight, Amps.	Watts.	Auxiliary lights, cab and markers.	Approx. total watts.	Steam, per hr., lb.	Steam per kw. hr., lb.
1	198	3642	30.7	3 1/8	96	5	255	106	416
2	198	3578	30.5	3	91.5	None	91.5	90	984
3	198	3727	29	00	00	None	00	74	...
4	198	3549	29.5	3	88.5	4—1	328	119	363

In test No. 4 one of the Westinghouse headlight lamps was put in place of one of the Marker lights in order to note operation of generator with a little overload.

Steam used per hour by type "S" in operating headlight alone in comparison with type "C" which is most in use and with the later compound wound type "E" as follows:

Steam lb. used per hour.		
Type "S"	90 lb.	Test above.
Type "E"	215 lb.	Test by Pyle Co.
Type "C"	421 lb.	Test report of Dec. 16, 1912

The type "S" turbo-generator is a small compact unit, its weight compared with types "E" and "C" as follows: Type "S," 125 lb.; type "E," 290 lb.; type "C," 350 lb.

It operates satisfactorily in round house test and in road service is easy to regulate and entirely closed in and protected from sand and dirt and appears to be a satisfactory generator for the low current required by the tungsten incandescent lights.

Distance test of the 120 watt 32 volt incandescent used in above test was reported September 30, 1913, as follows: Three men on track observed as obstruction of some kind, 1149 ft; 1 to 3 men on track counted from cab, 854 ft. Running test, approximately 30 m.p.h., 3 men on track observed as obstruction of some kind 976 ft.

Discussion.

Many of the views expressed by Prof. Scrugham were approved by Howard Stillman, chief mechanical engineer for the Southern Pacific Company. He did not approve of too much brilliancy in electric headlights and was opposed to the plan of dropping the headlight to the center of the engine. He earnestly looked for federal legislation upon this subject and declared the railroads would greatly appreciate a uniform law upon the subject.

"The essential feature of the electric headlight is the certain amount of brilliancy upon a certain object, and both brilliancy and object should be specifically agreed upon before additional legislation is enacted," declared A. H. Babcock, chief electrical engineer of the Southern Pacific Company. The necessary points to consider in the source of the light was the reflecting surface and the type of lamp. One of the disadvantages of the arc lamp was the travel of the arc. The beam was not steady and a variation of the arc by 1/16 in. was apt to throw the beam wide of the track. Another disadvantage was the clouding of the reflector. With an incandescent lamp such as the nitrogen filled lamp, the beam was a constant and penetrating one and it could be accurately focussed on the point desired. The matter of power supply could be taken care of either by a turbo-generator or storage battery—the latter having many advantages. It would only be necessary to supply a battery of capacity sufficient to carry the light over any emergency.

Frank Ingram, secretary of the Brotherhood of Locomotive Firemen, had ideas of his own when it came to tampering with headlights. At present he was satisfied with the arc headlight and would prefer to stay with that type until others had been experimented upon and demonstrated to be of

superior grade. Brilliancy was his idea in a light and the more illumination the better. The Nevada laws called for a light generating 1500 candlepower, and as this was the standard in 11 other states, he believed national legislation should be enacted containing a like provision. Ingram declared that at the last convention of his brotherhood the president had been instructed to take the matter up with congress in the hope of securing a federal law.

R. Holland, a locomotive engineer on the Sacramento division of the Southern Pacific line, did not agree with Ingram and declared that too much brilliancy was a detriment, instead of aiding the men in the cab, and cited several instances wherein people had been blinded temporarily by lights that were exceedingly brilliant. The variance of the laws now on the statutes in the different states was serving to retard the railroads in adopting a headlight of uniform brilliancy, declared Holland and as soon as a uniform law was secured he predicted that every road would hasten to meet the requirements.

The use of electric headlights had served to reduce accidents on railroads, according to R. B. Stowe, assistant master mechanic of the Southern Pacific. He declared when the electric lights was first brought out, eight were placed in use on the Southern Pacific. Then came orders to install 100 lights on locomotives and the results were watched with interest by both trainmen and railroad officials. Shortly afterwards 800 electric lights were in use and it was not long until the entire system had underwent a complete change from the old oil lamps.

O. Kearns, a locomotive engineer on the Sacramento division of the Southern Pacific, indulged in reminiscences regarding the old oil headlight.

"I started my railroad career as a callboy," said Mr. Kearns, "and at that time the engineers were attached to certain engines. All took a pride in their lamps and would spend spare time polishing the reflectors. It was two years before I was even permitted to light a headlight and considerably longer before the engineers would permit me to trim the wick." Kearns favored the arc light instead of the incandescent, stating that in a wind storm, when the glass shield was broken the arc would continue to do duty.

The new nitrogen lamp was favored by A. C. Myers, assistant electrical engineer of the Southern Pacific, providing the light could be held on the track and object, without the jumping as is now experienced in the arc light. Myers also said that the incandescent lamp has many features and advantages over the arc lamp.

R. H. Bishop, representing the Brotherhood of Locomotive Firemen, said that a good light was needed and was in favor of adopting legislation to secure a uniform law on the question. He preferred the arc to the incandescent lamp, and stated that with the use of the incandescent it might be necessary to return to the old custom, for with the breaking of the lamp a white lantern might be pressed into use, which was next to nothing when brilliancy was concerned.

Excessive brilliancy was dangerous, according to the opinion as voiced by A. M. Meston, air brake expert of the Southern Pacific, who said that an exceptionally bright light would serve to confuse signals. He called the attention of the delegates to the mass of signals and signal towers in use at the Oakland mole. The eyes would become affected by the extra brilliancy and it would be an easy matter to confuse the colorings of the green and red lamps. Mr. Meston was the last to participate in the headlight discussion.

Headlight Tests.

After the close of the conference on Tuesday evening a special train was provided for the guests and officials and a very interesting series of tests was made of electric headlights on the Southern Pacific tracks at a point near Laughton's Springs about five miles west of Reno. The test was very conclusive in demonstrating that the low candlepower nitrogen lamp was far more effective than the arc. The nitrogen lamp used was a 120 candlepower lamp of General Electric manufacture, that had been used about 400 hours. It threw a sharp, steady, penetrating beam without flicker or glare. By it, objects were picked up from one and four-fifths to two and a half times as far as by the arc lamp.

Engine 3019, equipped with the nitrogen lamp and engine 2320, equipped with a Pyle National arc lamp, were used in the tests. In the standing test, the obstruction (three men dressed in black clothing), were picked up at 1160 ft. with the aid of the arc lamp. The nitrogen lamp picked the men up at a distance of 1900 feet.

In one running test the arc lamp picked up the obstruction at 674 ft. while the nitrogen lamp picked up the object at 1508 ft. In the other running test the arc lamp picked up the object at 860 ft. and the nitrogen lamp at 1606 ft.

The tests were conducted under the supervision of Prof. James G. Scrugham and Governor Oddie. The Southern Pacific officials present included R. J. Clancy, assistant general manager; A. H. Babcock, electrical engineer; Howard Stillman, mechanical engineer; Norman Collyer and A. C. Myers. Among the representatives of the trainmen who conducted the tests were Legislative Agent Bishop of California; O. Kearns, chairman of the grievance committee; W. E. Wallace, member of the Nevada Industrial Insurance Commission and legislative representative in Nevada, and Frank Ingram of Sparks, who, as secretary of the Brotherhood of Locomotive Firemen, read a paper before the afternoon conference, advocating the higher power arc lamps.

At the conclusion of the test the trainmen who had been so strongly in favor of the arc light, expressed themselves in favor of the new nitrogen lamps and stated that they would like to see them installed as soon as possible.

Nevada's law requires a 1500 candlepower headlight, and from present indications, the trainmen who secured its passage will probably ask its repeal at the next session of the legislature so that the smaller, but more efficient lamp, may be introduced in its place.

Concrete poles reinforced with ⅜ in. bars have been commercially made in Canada at a total cost of less than five dollars each for 24 ft. poles with 8 in. base and 5 in. top and of less than eight dollars for 30 ft. poles with 8 in. base and 5 in. top, including steel cross-arms and iron conduit pipe.

The extensive use of poles for overhead distribution is emphasized by the fact that in the United States there are, over eight hundred thousand miles of pole lines. There are in service today over thirty-two million poles. The annual renewal requirements are over four million, and of these large totals it is claimed over sixty-five per cent are cedar.

Low rates for electric heating are possible in several Western states where large amounts of hydro-electric power are used for irrigation pumping during the summer months. During the winter a large surplus generating capacity would ordinarily not be used but by charging just enough to maintain the extra distributing capacity it is possible to thus popularize the use of electricity. At Visalia, Cal., the Mt. Whitney Power & Electric Company makes a charge of 10½c per kw.-hr. for the first 20 kw., 3½c for the next 150, and the balance at 1c with a 15 per cent discount for prompt payment each month. At Twin Falls, Idaho, the rate is $16 per kw. season in 10 kw. quantity, this being sufficient to heat a 5-room house.

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Industrial Safety Conference

Considerable credit is due the University of Nevada for their praiseworthy part in inaugurating the industrial safety conference, which has just been brought to so successful an issue at Reno. The impetus given to the "safety first" movement should be far reaching, as each of those who attended will return to his own center of activities to there further promulgate that spirit which prompted the conference. Safety First!

Perhaps the most important subject discussed was that of locomotive headlights. At the present time there is an extreme lack of uniformity on the statute books of the different states as to what constitutes a legally "safe" headlight. Moreover the wording of the various laws is often in ambiguous non-technical language and not as definite in any case as progress along the line of illumination engineering as applied to locomotive headlights, would permit.

The information brought out by the presentation of Prof. J. G. Scrugham's paper on this subject, the discussion and the test made, all form a basis for the removal from the statutes of the present generally unsatisfactory headlight laws and the enactment of those satisfactory to transportation companies, their employes—more particularly the engine drivers—and to the travelling public.

The radical changes possible are due to the use of the new nitrogen filled lamp which permits greater control of the light flux so that better illumination of distant objects is obtained.

An aphorism expressive of one phase of the safety first idea is, that it is better to cause a delay than an accident. While in some matters it is advisable to make haste slowly, yet with the way opened up for the adoption of the more scientific, more satisfactory and safe method, it would be better far to heed the adage, Delays are dangerous.

Safe Railroad Travel

The Southern Pacific Company was awarded the Harriman Memorial Safety Medal by the American Museum of Safety. This medal is evidence of the best record of accident prevention throughout the year 1913, of all the steam railroads in the United States.

Had the time been extended to cover five years the same company would undoubtedly have still occupied first place, for during that period just past, not one passenger's life has been lost through the collision or derailment of trains on their line.

When it is realized that this record covers the remarkable total of eight thousand million passenger-miles, it will be evident that the impossible may always be attained.

At the Reno industrial safety conference it was brought out that not more than one-third of the reduction in accidents which has taken place, is due to the use of safety appliances but that two-thirds of these reductions were due to the education of employes; through getting into touch with the workmen, and securing their co-operation.

That the Southern Pacific Company has taken both factors into consideration was borne out by significant statements also made at that time. This com-

pany's safety work has cost for automatic block signals, $3,400,000; for interlocking block signal plants, $1,500,000; for crossing signal systems, $1,400,000, and $262,000,000 in ten years for all purposes.

But to ensure the successful use of these, education of the employe was essential. That the company equally considered this phase was brought out by the remarkable record of tests made. Three thousand one hundred and ninety-four surprise tests in 1913 showed a safety percentage of 99.56 over six thousand three hundred miles of trackage, while another set of two thousand two hundred and eighty-six surprise tests showed one hundred per cent efficiency.

It can be done. The travelling public may be adequately protected. But probably before this absolutely safe period of travel over all lines arrives, the public will need to be educated to a realization of the important factor which they themselves are, and be willing to pay the piper in order to have the certain assurance of safe travel.

The Silver Lining

The old-time ominous cloud overhanging the hydroelectric development of the West has shown signs of breaking. During the past few days the rift has widened further, showing the proverbial lining of even greater promise. To the West this is gratifying.

This journal has always been the advocate of a sane conservation, that is to say, a wise use of water power with adequate protection to all interests, and absolutely opposed to any withdrawal methods which would in any way tend to throttle industry or to deprive the people of the advantages due to development.

The public's educated fearfulness which first hindered full and continuous development of water power sites, had its inception at a time when the conservation of all natural resources, renewable, as well as those which with time can never be renewed was being advocated. This resulted unfortunately for the public, for the opposite to the desired result was achieved.

Where development of water power was halted, non-renewable fuels had instead to be used for the generation of needed power. It was the same result which always obtains when the substance is lost in the grab after the shadow.

The water loses nothing by its use for power purposes, neither is the power conserved by non-development. It must be either utilized or allowed to run to a worthless waste.

A stoppage of this enormous waste is possible only by giving to the people and industries of the several states in which these water power sites are to be found, a cheap and bountiful power supply.

Latterly the Forest Service which has had control of hydroelectric development in the West, due to the fact that the principal undeveloped water power of the country is to be found on Forest Reserves, has been better disposed toward the idea of complete development, but the unwieldy regulations of that department still leaves much to be desired.

The Federal government may also still exact a rental, that is, a taxation, for the development of water power sites, but with the now more efficient commission control there is but little excuse for this provision to continue.

This is especially true too in view of President Wilson's statement anent the California Alien Land Law in its bearing upon Japanese immigration that "the Federal Government cannot under the constitution dictate to a state what its land laws should contain."

Coincident with the issuance of this statement the supreme court of California rendered a decision regarding reserve lands, the gist of which was that it is a departure from the accepted construction of constitutional provisions, for the Federal government to withdraw from state use, one-third the area of a sovereign state, as is the case in California, forever deny to the state the sovereign power of control over these lands, and develop and exploit them under its own rules and regulations for the enrichment of its own treasury.

The light thrown on the subject of hydroelectric development by this dual interpretation of the law, minimizes the power of those influences deterrent to development, and brightens the outlook with a bow of added assurance.

Federal Telephone Ownership

The expected statement from the Postmaster General advocating government ownership of all means electrical for the transmission of intelligence, was made during the past week in a report which was submitted to the United States Senate. The report was in response to a resolution asking that he make an investigation of the subject as an extension of the postal service.

Ownership of the telephone lines is advocated for the reason that telegraph service may more readily be super-imposed upon telephone lines than vice versa. It is concluded that it would be unwise for the government, from a commercial point of view, to acquire by purchase, the telegraph lines. The telegraph business is on the wane, speaking comparatively and competitively.

The cost of acquiring the telegraph facilities is estimated at two hundred and twenty-five million dollars and of the telephone long distance and toll lines, two hundred million dollars.

Present reports do not give any further essential details. The method in which it is proposed to operate these apparently inevitable government owned telephone lines is of great importance to all, for any dis-ease in this nervous system of the nation's life would prove disastrous.

A central control too remote from the extremes of the system might also prove a disadvantage.

A possible solution of this new problem will be found in state ownership of long distance lines with interstate co-operation on the part of the Federal Government, and municipal or private ownership of local systems, for the American people are not ready for any very radical changes along this line.

Whatever the method followed it will be many years before a complete adjustment to such a change can be conveniently effected.

Developments will be followed with interest.

PERSONALS

ITEMS FOR THIS DEPARTMENT ARE SOLICITED FROM ALL READERS

Sidney Sprout, consulting engineer, San Francisco, has returned from the East.

Frank Fowden, Brooks-Follis Electrical Corporation, was at Sacramento last week.

J. O. Presbey, Holophane Works of General Electric Company, is at Denver.

J. E. Leavitt is now manager of the Portland office of the Van Emon Elevator Company.

Andrew Carrigan, of Dunham, Carrigan & Hayden, has returned to San Francisco from Chicago.

F. H. Whipple, owner F. W. Whipple Machinery Company, Visalia, Cal., was at San Francisco last week.

Geo. R. Murphy, of the Pierson-Roeding Company, was at Los Angeles on business during the past week.

O. F. Swenson, salesman, with Hunt, Mirk & Company, is at San Francisco, having returned from Washington.

C. V. Schneider, president Electrical Supply Company, Sacramento, was at San Francisco during the past week.

J. A. Ulmer, president, J. Ulmer Machinery Company, Porterville, Cal., was a visitor at San Francisco during last week.

Al Sprout, electrical engineer, California-Oregon Power Company, was at San Francisco from Yreka during this week.

L. S. Twomey, superintendent Oakland Lamp Works, was recently elected a member of the Illuminating Engineering Society.

H. C. Goldrick, Pacific Coast manager, Kellogg Switchboard & Supply Company, has returned to San Francisco from the East.

Elmer Dover, vice-president of H. M. Byllesby & Company, is at present in the East, but expects to return to Seattle at an early date.

K. G. Dunn, vice-president, Hunt, Mirk & Company, San Francisco, has returned from a business trip made throughout Southern California.

J. F. Walters is now president of the California Electrical Supply Company, vice **R. L. Wolden**, who has disposed of his interests in the business.

John Harisberger, superintendent of transmission, Puget Sound Traction, Light & Power Company, Seattle, is spending two weeks at Los Angeles.

George C. Cooke, of the American Cross Arm Company, spent several days in Seattle this week, returning to Centralia, Wash., on Thursday.

W. C. Johnson, resident salesman, Westinghouse Electric & Manufacturing Company, Bakersfield, is at San Francisco; also **W. E. Lee**, resident salesman at Fresno, Cal.

Sylvester M. Baker, Macbeth Evans Glass Company, was, on account of a severe cold, compelled to curtail his Southern California business trip and has returned to San Francisco.

Thos. A. Edison, who is still actively engaged in the development of the electrical industry, passes the 67th milestone next week, having been born at Milan, Ohio, on February 11, 1847.

A. B. Mann, manager refrigeration machinery department, H. W. Johns-Manville Company, San Francisco, has left for Fort Wayne, Ind., where he will visit the Fort Wayne Works of General Electric Company.

Prof. J. G. Scrugham, Hal Lemmon and **F. O. Broili**, all of Reno, were named a committee to consider "safety first" questions in Nevada, at the recent industrial safety conference held at the Universityo of Nevada.

W. E. Herring, industrial agent, Puget Sound Traction, Light & Power Company, recently delivered an address on the power situation in the northwest before the supervisors of the United States Forestry Service.

Herman Bamberger, vice-president of the Salt Lake and Ogden Railroad Company, the Bamberger electric line to Ogden, is representing his company at the midwinter convention of the American Electric Railway Association in New York.

W. J. Grambs, superintendent of light and power for the Puget Sound Traction, Light & Power Company, has been promoted to the position of assistant to the president. **Geo. E. Quinan**, operating superintendent of the company, will succeed Mr. Grambs as superintendent of light and power.

F. M. Sammis, chief engineer, The Marconi Wireless Telegraph Company, New York, and **J. R. Irwin** of Seattle, superintendent of the North Pacific district were at Astoria, Oregon, during the past week negotiating for a site upon which the company intends to erect one of the largest wireless stations on the Pacific Coast.

John L. Timmins has returned to Fairbanks, Alaska, from the Totatlanika country. His company, the Tanana Gold Fields Mining Company, expects to instal a power plant in the Nenana Goldfields region with the idea of supplying its properties in the Fairbanks district. Preliminary survey work will be done next March.

H. F. Holland, representative of the Simplex Electric Heating Company in the intermountain district, has returned from his midwinter trip to the factory at Boston. He reports that the activity shown in electrical appliances, and particularly electric cooking appliances, is greater in his territory than in any other served by his company.

D. C. Henney was appointed chairman and **H. B. Hastings** and **T. D. Weber**, as members of the committee appointed by the Oregon Society of Engineers, at the instigation of the Civil Service Commission of Portland, Oregon, to draft examination questions for the test of those candidates who apply for positions with the city, in which technical training is required.

S. C. Haver Jr., Southern California Edison Company, has been transferred from assistant agent at Long Beach, to the position of collection agent, with office in the Edison Building. **George B. Simpson**, formerly chief clerk in general agent's office, has been transferred to Long Beach district as assistant agent, and **J. Harry Peiper**, engineer of illumination and vehicles, in addition to his other duties, will assist in handling correspondence and other matters in the general agent's office.

Dr. F. J. H. Merrill, secretary American Institute of Mining Engineers, has been appointed chairman of a committee appointed at Los Angeles to arrange for joint engineering headquarters in that city. The other members of the committee are: **Fernand Parmentier**, secretary Southern California Chapter, American Institute of Architects; **C. G. Pyle**, secretary Los Angeles Section, American Institute of Electrical Engineers; **W. K. Barnard**, secretary, Los Angeles Branch, American Society of Civil Engineers; **Walter L. Jordon**, secretary, Southern California Section, American Chemical Society; **G. M. Swindell**, secretary Chamber of Mines and Oil, and **H. Z. Osborne Jr.**, secretary, Los Angeles Engineers' and Architects' Association, who is secretary of this committee also.

MEETING NOTICES.

Oregon Electrical Contractors' Association.

The regular monthly meeting of the Oregon Electrical Contractors' Association took place at the Portland Commercial Club on Wednesday evening, January 28th at 6:30 p. m. At this meeting certain constitutional amendments were considered, and some features of the new electrical ordinance were discussed.

Oregon Society of Engineers.

The third annual dinner and business meeting of the Oregon Society of Engineers was held in the blue room of the Multnomah Hotel, Portland, Oregon, on Monday, February 2d, at 6:30 p. m. A number of ladies were present. The two principal speakers were: W. E. Coman, vice-president and general manager of the Northwest Electric Company, and Franklin T.

Griffith, president Portland Railway, Light & Power Company. There was a good attendance.

Electrical Development and Jovian League.

An enthusiastic meeting was held after the regular luncheon at Tait's last Tuesday for the main purpose of electing Jovian officers. Under great pressure, Mr. A. E. Rowe was persuaded to continue the good work which he has started and was re-elected Statesman.

The Hawaiian Band was present and rendered several selections. Mr. A. C. Taylor, agent Hawaiian Promotion Committee, also gave an interesting talk on Hawaii, which was illustrated with lantern slides.

Joint Meeting Portland Section, A. I. E. E. and N. E. L. A.

The February meeting which was well attended, was held on the 3d inst., at the Hawthorne building, Hawthorne avenue and Water street, at 8 p. m., at which L. F. Harza presented a paper on "New and Proposed Regulations Affecting Water Power Development." C. A. Huggins, secretary and treasurer, Portland Railway, Light & Power Company, presented Mr. R. D. Mershon's paper on "Some Things Engineers Should Know Concerning the Rudiments of Corporate Finance," which was also discussed.

The dancing party given by A. I. E. E. and the N. E. L. A. local sections at the Multnomah Hotel on the evening of January 27th was a huge success. The party was attended by 75 couples and every one present had a most delightful time. The program committee provided an opportunity for the graphic representation of single-phase (one-step), two-phase (two-step), and three-phase (three-step) curves. Everyone present agreed that engineers should be given more opportunities to make these graphic diagrams.

Proposed Engineers' Headquarters at Los Angeles.

A meeting of the officers of various technical societies was held at the Hollenbeck Hotel on Friday, January 30th, with a view to arranging for joint engineering headquarters in Los Angeles. A committee was appointed, which includes the secretaries of all such organizations having local representation. Dr. F. J. H. Merrill, secretary of the American Institute of Mining Engineers, Los Angeles Section, was appointed chairman, and H. Z. Osborne, Jr., secretary of the Engineers' and Architects' Association, secretary.

Jovian Electrical League of Southern California.

The Jovian Electrical League of Southern California held its weekly luncheon at Christopher's on Wednesday, the 28th instant, with F. S. Schuyler as chairman of the day. Rev. Baker P. Lee delivered a most interesting sermon, taking as his subject "Wireless Flashes." The Reverend Mr. Lee is a pastmaster in putting old truths in a new form, and it is doubtful if the League ever listened to a more interesting talk. There was an attendance of about 120 members and visitors. Next week the League will be the guest of the John A. Roebling's Sons Company, at their new factory, 216 South Alameda street.

Los Angeles Section A. I. E. E.

The Section held its regular meeting at Blanchard Hall on Tuesday evening, January 20th. P. E. Taylor presented a paper on "The Electrical Precipitation of Dust from Rotary Cement Kilns." R. H. Manahan, Walter A. Schmidt, H. M. Mosher and J. A. Lighthipe participated in the discussion, also Wesley Beach, an attorney, who gave some interesting information leading up to the necessity for devising means of overcoming the damage to agricultural interests on account of the cement dust. A communication on the subject from Harris J. Ryan was read by T. A. Panter. There was an attendance of 76 members and visitors.

The Society for Electrical Development.

The board of directors of the Society for Electrical Development held a meeting at the Society's headquarters, 29 West 39th street, New York City on January 26, 1914. A considerable number of important matters were thoroughly discussed. Reports of J. M. Wakeman, general manager, and Stephen L. Coles, acting secretary-treasurer, which covered the operations of the Society up to date, were read and accepted. Stephen L. Coles, who has been acting secretary-treasurer of the Society for the past six months, was elected secretary-treasurer. Fifteen of the board of directors were in attendance. The meeting adjourned to February 17th.

Seattle Jovian League.

The regular meeting of the Jovians was held Friday, January 30th at the Rathskeller Cafe. Several communications were read. The after-dinner speaker was S. F. Rathbum of the Dexter-Horton Bank, who spoke at length on the opportunities which will be presented with the passage of the Alaska Railway Bill.

Mr. Rathbum's talk was general. He described the topography of Alaska and the rainfall at various districts to show the possibilities of developing water power.

Mr. Rathbum is one of the leading financiers of the North Pacific territory and has made an extensive study of conditions in Alaska, realizing that this new development of its resources will be of great benefit to the Puget Sound territory.

Utah Electric Club.

The regular weekly luncheon of the Utah Electric Club was held at the Commercial Club, Salt Lake City, Thursday, January 29th.

The entertainment committee reported in favor of a smoker and athletic tournament to be held Thursday evening, February 12th, and the committee was empowered to go ahead and make arrangements for the event.

L. N. Perrine, chief engineer of the Shoshone & Twin Falls Railway Company, gave a short description of that company's plants and cordially invited the members of the Electric Club to visit the Falls whenever it was convenient.

The talk of the day was made by Mr. Dorsey A. Lyon, metallurgist for the U. S. Bureau of Mines, located at the University of Utah. Mr. Lyon gave a brief outline of the work of the Bureau of Mines and its relation to the mining industry in Utah.

Utah Electric Light & Railway Company Section, N. E. L. A.

The regular meeting of the Utah Electric Light & Railway Company section of the National Electric Light Association was held at the company offices Wednesday, January 28th. J. Harry Tempest, vice-president, presided.

The question of omitting the February dinner of the Section and combining it with a half-day outing at Pine-crest, the new hotel and summer resort at the head of Emigration Canyon, was referred to the executive committee for decision.

Bayard W. Mendenhall, commercial agent, presented the paper of the evening on the subject, "The Trend of Electric Rates," in which he outlined briefly the history of electric rates, the factors which have entered into their evolution, and the trend of the rates as indicated by some of the more recent ones adopted, and by the rulings of state commissions.

A vigorous discussion followed in which practically all of those present participated.

Alameda County Electrical Development League.

The Alameda County Electrical Development League held its monthly meeting Saturday afternoon, January 31, 1914, at the Avenue Restaurant. The meeting was well attended, 50 members being present and composed of representatives of the power companies, jobbers, dealers, contractors and lighting fixture dealers, wiring contractors and jobbers par- League is to improve the quality of electrical work being done and so give the consumer the best possible installation and service. The latest devices are discussed and a general educational campaign is being carried on. Geo. B. Furniss of

the Pacific Gas & Electric Company, Oakland, is president, and Geo. G. Drew of the Pacific States Electric Company, Oakland, secretary.

The most important matter brought up at the last meeting was the hanging of lighting fixtures; who this should be done by, and the cost factors to be considered. Representative lighting fixture dealers and wiring contractors and jobbers participated and a committee was appointed to report further on the subject.

American Society of Civil Engineers.

The Portland Association of the American Society of Civil Engineers, at its monthly banquet at the Commercial Club, Portland, Oregon, on Tuesday, January 27th, heard a paper on the Celilo Canal read by F. C. Schubert, assistant Federal engineer. who has been prominently identified with the work since the inception of the project in 1905. Mr. Schubert made the final location following the preliminary activity and designed the work.

"This government canal," he said, "is designed to surmount the only barrier remaining, since the completion of the Cascades Canal 45 miles below, to continuous navigation of the Columbia River from the Pacific Ocean to Priest Rapids, Washington, a distance of 407 miles. The Celilo Canal is eight and one-half miles in length and has a bottom width of 65 ft., with a navigable depth at low water of 8 ft. It is to have four locks and will overcome four natural obstructions. The canal will be in operation from 9 to 11 months of the year, depending upon the severity of the June freshets and upon the presence or lack of ice in the river."

The project is 76 per cent completed, Mr. Schubert, estimates, and will be open for traffic by January 1, 1915, providing funds for the completion of the work are made available by congress at its present session.

In the absence of E. G. Hopson, president of the association, W. S. Turner, vice-president, presided.

Valentine Dance at Portland.

The General Electric Company and affiliated interests at Portland, Oregon, have arranged for an invitational dance for their employes and their friends, to be held on Saturday evening, February 14th, at the Hotel Multnomah. It is to be a Valentine dance and "no flowers" are requested. The committee in charge is: H. P. Cramer, E. A. West, Geo. A. Boring, A. M. Sherwood Jr., F. L. Whipple, W. R. Bagnall.

NEW CATALOGUES.

(Under this heading attention is directed to catalogues and bulletins representing the latest information upon the subjects treated. The latest developments are always in advance of the most up-to-date text books. Readers are urged to write direct to the publishers for these catalogues and bulletins, which, unless otherwise stated, are available for free distribution.)

Fourth Biennial Report of Oregon State Engineer, by John H. Lewis, Salem, Oregon; 90 pp., 6x9; 4 maps; numerous illustrations.

Mineral Resources of the United States, 1912; Part II; Non-Metals; 1218 pp.; 6x9; U. S. Geological Survey, Washington, D. C.

Water Supply Paper 337. The Effects of Ice on Stream Flow, by W. G. Hoyt; 1913; 77 pages; 7 plates; 18 text figures; U. S. Geological Survey, Washington, D. C.

Automobile Lighting and Battery Charging with the Holtzer-Cabot Magneto Generator is the subject of an attractive 12-page pamphlet from the Holtzer-Cabot Electric Company of Brookline, Mass.

Copper Wire Tables, Circular No. 31; U. S. Bureau of Standards, Washington, D. C.; 69 pp.; 7x10. Prepared at the request of the A. I. E. E. Standards Committee. Complete tables and explanations.

Wind Resistance of Steam Turbine Wheels, by Edgar Buckingham, U. S. Bureau of Standards, Washington, D. C.; 40 pp.; 7x10; a critical study of the experimental data which have been published and of equations for representing them.

The General Electric Company has just issued Bulletin No. A4199, which illustrates and describes that company's Railway Motor Gears and Pinions. It contains curves and data which will be of especial interest to purchasers of this material.

"Scientific Gas Rates" is the subject of an interesting pamphlet being distributed by Henry I. Lea, consulting gas engineer, Peoples Gas Building, Chicago, wherein it is ably contended that gas companies should equip themselves with facts to convince courts and commissions that their rates are on an economically sound basis.

The General Electric Company is just distributing its annual catalogue A-4197 of Electric Fans. This catalogue illustrates and describes the company's line of fans for the season of 1914, for table, wall and ceiling mounting, and describes also small ventilating outfits, fans which are moistureproof and have fittings which are non-corrosive, for use especially on ship-board.

Circular W M 509 has been issued by the Westinghouse Machine Company, which deals very thoroughly with the application of low pressure turbines. Circular W M 510 issued by the same company, describes that company's 1 kw. general utility turbine driven lighting outfits and the application of same. Dimension and construction details are given. The bulletins may be secured by addressing the Pacific Coast representatives of the company, Hunt, Mirk & Company, Inc., engineers and contractors, San Francisco.

"Pelton Water Wheels, Turbine and Tangential," is the subject of a valuable 100-page publication now being distributed to interested parties by The Pelton Water Wheel Company of San Francisco and New York. While this text is nominally only illustrative of the "Pelton type of design" of tangential and turbine wheels, gate valves, nozzles, governors, pipe-lines and pumps, it is in reality a practical handbook on modern hydraulic power practice. The purpose, design and typical installation of each type of apparatus is concisely stated in interesting text and beautifully illustrated by means of fine half-tones, paper and press work. The pictures include examples of many actual installations not heretofore described elsewhere. Tangential water wheel tables have been computed to show the maximum power that may be efficiently developed by tangential wheels of various diameters under different heads.

TRADE NOTES.

The Seattle, Wash., Board of Public Works, has awarded a contract to Pierson, Roeding Company for 57,096 lb. of weatherproof feeder cable.

The Pierce-Tomilson Electrical Company installed the electrical equipment in the Portland auto show which is now in progress at the armory.

The Dock Commission of Portland, Oregon, has nearly completed electrical specifications for Unit No. 1 of the Municipal Dock and bids will be called for soon.

The contract for installing the ornamental street lighting system on Metcalf street, Sedro-Woolley, Wash., was awarded to the Pacific Northwest Traction Company for $2170.78.

H. B. Squires Company of San Francisco and Portland, electrical manufacturers' agents, have taken over the additional territory of the Cutler-Hammer Manufacturing Company in Southern California, and in view of this fact have opened an office in the San Fernando Building, Los Angeles, to handle the Cutler-Hammer and their other lines. Mr. C. W. Yerger, who has been connected with the engineering department of The Cutler-Hammer Manufacturing Company at Milwaukee for several years, will be in charge of the Los Angeles office.

NEWS NOTES

INCORPORATIONS.

RUPERT, IDAHO.—The Star Electric Light & Power Company has been formed here and will engage in a general electric business. J. P. Pucket is manager of the new company.

FINANCIAL.

SEATTLE, WASH.—A $7,000,000 bond issue is announced by the Puget Sound Traction, Light & Power Company. The entire issue has been bought by a syndicate headed by Lee, Higginson & Company, one of the big Eastern bond houses, the negotiations having been consummated through the Boston office of Stone & Webster. The bonds bear 6 per cent interest, and run for five years, being redeemable February 1, 1919. The proceeds are to be used in retiring short-time notes due February 1 next, and for improvements and extensions to be made in and near Seattle during 1914. Within the past sixty days the company has also made an additional issue of its preferred stock to the extent of approximately $2,500,000, a part being subscribed by stockholders at par and the balance being taken by an Eastern banking syndicate. The preferred stock pays dividends at the rate of 6 per cent and the common at the rate of 4 per cent. Net earnings are sufficient to take care of all dividend requirements, interest on all other outstanding obligations, and still leave an amount over twice the interest charges on the new $7,000,000 bond issue.

ILLUMINATION.

BEAUMONT, CAL.—The Beaumont Gas & Power Company has applied for an electrical franchise to cover the greater portion of this city.

LOS ANGELES, CAL.—A landslide caused by the recent heavy rains, carried away about 500 ft. of Midway Gas Company's pipe line near Balboa, completely cutting off Los Angeles' supply of natural gas.

TEMPE, ARIZ.—The city council has been petitioned for the installation of an electric light plant at the same time as a special election is being held for the voting on the proposition of issuing sewer bonds.

HURRICANE, UTAH.—A special election was held January 27th for the purpose of voting on a proposal to bond the town in the sum of $5,000 for the installation of an electric light plant. The proposal carried.

SANTA BARBARA, CAL.—Proposed extensions of the electric system into both Carpinteria and Goleta districts are under consideration by the board of directors of the Santa Barbara Gas & Electric Company.

CORVALLIS, ORE.—That it will cost $111,570 to install a power plant and system adequate for Corvallis is the conclusion of the Commercial Club committee, composed of H. M. Parks, W. A. Hillebrand and A. H. Swartley.

HELENA, MONT.—The city council has designated March 28th for the special election when the taxpayers will vote on the question of granting a franchise for an electric light and power plant to the Standard Engineering Company, of which A. L. Goldschmidt is secretary.

BANNING, CAL.—Plans for a supply of electricity from the Southern Sierra Power Company at Banning are now under way, and work of stringing lines will be started immediately. The estimated cost is $281,655 and the plans include a substation and distributing system at Coachella.

PROVO, UTAH.—The city commission is considering a plan for improving the street lighting on the principal streets, as submitted by A. P. Merrill, local manager of the Utah Power & Light Company. It proposes to use fifty arc lamps, displacing the present incandescent street lighting system. The annual cost of the proposed system is $2800.

LOS ANGELES, CAL.—The board of public utilities has fixed the natural gas rate at 52 cents per 1000 cu. ft.; artificial gas rate at 70 cents, and for a mixture of natural and artificial gas at 61 cents. The action of the board was unanimous, and now awaits the approval of the city council, to become immediately effective until July 1st, the annual rate making date as provided by law. The board has ruled that the mixture of natural and artificial gas shall be on an even half and half basis.

LOGAN, UTAH.—The Utah Power & Light Company is conducting here an extensive demonstration of the numerous possible applications of electricity on the farm at the Farmers' Round-up in progress at the Agricultural College during this and next week. The features of the exhibit attracting the most attention are the electric ranges, which appeal particularly to the farmer's wife, and the irrigation pumping exhibit, which demonstrates so clearly the simplicity and economy of this method of irrigation.

LEBANON, ORE.—The petition of Scroggins Washburn asking for a vote to decide the question of a 20 year franchise to construct an electric light and water plant within the city limits has been disposed of. The council is unanimously in favor of municipal ownership of the light and water plant. The Lebanon Light & Water Company made a proposition to the city to buy its plant. They propose to sell the plant for actual value according to holdings shown on the books. Besides the machinery, building and pumping plant the company has a half interest in the canal, and it may be bought by bonds at 6 per cent. It is possible that the question may be put before the voters at a special election.

TRANSMISSION.

QUINCY, CAL.—Application has been made to the supervisors for right to erect and operate lines for transmitting electricity along roads in Plumas county by R. B. Young of Loyalton, Cal. Sealed bids for the franchise will be received until March 12.

KALAMA, WASH.—The wooden frame power house on stone and cement base owned by the Washington-Oregon corporation was destroyed by fire with a loss of $45,000. The three generators and all electrical equipment are worthless. The plant will be rebuilt on a larger scale.

LOS ANGELES, CAL.—A contract for leasing of power distributing systems of three local power corporations by the city for five years with option to purchase, has been submitted to the corporations. Upon their acceptance or rejection of contract depends whether the city will come to agreement on resume the fight for municipal distribution along old lines.

VICTORIA, B. C.—A new company just incorporated is the Stamp Falls Power Company, with a capital of $150,000. Its objects are important to the development of the center of Vancouver Island. Among which are to acquire the rights of the Ritchie Agnew Power Company in the Alberni District, and an option to purchase all the interests of the British Columbia Hydraulic Power Company and water rights on Nanaimo River, and the company's 40 year franchise for electric lights, power and heat in Nanaimo.

PORTLAND, ORE.—A system of switching so that their load dispatcher in the Electric Building can disconnect the trolley wires and their feeders, which are overhead in the "fire limits" of Portland, when a fire breaks out in any portion of the "fire limits," has been devised by the Portland Railway, Light & Power Company. This system is kept under constant test in order that each section may be intact and not interfered with by unauthorized parties. A complete map of the

system is in the hands of the fire department. Also a "Tapper Bell" has been installed in the Load Dispatchers' office so that he gets all fire alarms.

SAN FRANCISCO, CAL.—Referring to the value of the recent heavy rains, John A. Britton, president of the Pacific Gas & Electric Company, says: "These rains mean a guarantee in hydroelectric operation of no low water such as we have had for the last three years. That also carries the guarantee of absolute service for the coming year. All our reservoirs are now full, and, in fact, could have been filled twice over. This includes Lake Spaulding, where the dam has been completed to the 225-foot level, impounding 45,600 acre ft. of water. The total amount of water in all the reservoirs of the company is now 40,000,000,000 gallons. But the great value of the rains is that the ground is now so saturated that the runoff will continue longer, and consequently the storage will not have to be drawn on till much later than usual."

SEATTLE, WASH.—The Secretary of Agriculture has issued a waterpower permit to the Washington Railway & Electric Company of Tacoma, authorizing it to occupy and use lands within the Snoqualmie national forest under the act of February 15, 1901, for the purpose of generating hydroelectric power. Isaac W. Anderson of Tacoma is president of the company. The project covered by the permit involves the erection of nine dams, water conduits and power houses. One of these dams is for the combined purpose of storage and diversion while all the others are for diversion purposes only. The total area which will be flooded by the nine reservoirs is approximately 2164 acres. The project is located on Sultan River in Snohomish county. A transmission line approximately 55 miles long, will be required to transmit the energy to Everett, which is the nearest possible market of importance. The total power capacity of the combined project as rated by the engineers of the service is 32,000 h.p.

TRANSPORTATION.

LOS ANGELES, CAL.—The Pacific Electric Company has applied for a franchise for double track to connect its line at Sixth street and Ceros avenue with the south end of the proposed new Arcade depot.

NEWPORT, ORE.—The city council has granted a franchise to the Portland, West Coast Railway & Navigation Company, allowing the company the use of the streets and giving it a lease on 500 feet of water front on the bay.

POMONA, CAL.—The Pacific Electric Railway's line at Upland, a new line running from Upland to Alta Loma, will have to be practically rebuilt according to report that flood waters washed debris, etc., over the tracks and carried a large portion of the track away.

PARKER, ARIZ.—A franchise has been granted to W. H. Tharpe and associates for proposed electric railway system for Parker and vicinity, and application will be made at once to the interior department for right of way through the reservation. Actual work is expected to begin within 60 days.

OGDEN, UTAH.—P. D. Kline, general manager of the Ogden Rapid Transit Company, states that construction work will be started as soon as weather permits on the extension of their line to Logan, and later to Preston, Idaho. Specifications are now being prepared for the material and equipment necessary for the construction of this line.

SALT LAKE CITY, UTAH.—The residents of Ninth East Street South of the city limits have petitioned the Utah Light & Railway Company to extend their street car line along this street as far as Fourteenth South. General Manager Joseph S. Wells reports that the matter will be investigated, and if sufficient business is in sight to warrant the extension, it will be made in the near future.

OAKLAND, CAL.—The San Francisco-Oakland Terminal Railways, under the new management following the reorganization, will soon place orders for from 50 to 100 new cars of the p-a-y-e type, to take the places of the worn ones and possibly to increase the service on congested lines. According to General Manager A. W. McLimona, the steps on the new cars will be lower than those now in use.

SAN FRANCISCO, CAL.—The board of works has assured merchants that their convenience will be considered in constructing the Municipal Railway on Stockton street. Representatives of stores on Stockton street from Market to Post, who appeared before the board last week, were informed that the work on their blocks could be done at any time from May to December, and that they could say which month would suit them best. At the same time the board intends to widen the roadway and reduce the width of the sidewalks.

SEATTLE, WASH.—Every obstacle in the way of the city of Seattle acquiring the nine miles of the Seattle, Renton & Southern Street Railway property within the city limits and its equipment by condemnation proceedings, was swept aside last week by the supreme court of the state of Washington, when it upheld against every objection the right of the city to condemn, but reverses the judgment of condemnation without dismissing the action, because the receivers of the company were not made parties to the case. The supreme court suggests in its decision that the city obtain from Judge A. W. Frater, who appointed Scott Calhoun and Joseph Parkin receivers of the property, permission to include them as parties to the suit, and then proceed with the condemnation of the street railway property. This decision is by far the most important handed down in connection with the municipal street car controversy. The city will at once apply to Judge A. W. Frater for permission to sue the receivers, Scott Calhoun and Joseph Parkin, and have them made parties in the condemnation case. This will require not to exceed three weeks, upon the receipt of the formal decision from the supreme court, and soon after that the city will appear before Judge Gilliam and ask him to set date for the trial of the case.

TELEPHONE AND TELEGRAPH.

GRASS VALLEY, CAL.—The Mariposa Rural Telephone Company has been granted a permit to construct a telephone line along roads of Nevada County.

BUTTE, MONT.—A receiver for the Montana Independent Telephone Company is sought in a petition in intervention filed in the district court in the suit of P. B. Moss of Billings against the Interstate Conrolidated Company. The petition is brought by holders of $17,000 worth of bonds in the Montana Independent Company. They allege that John MacGinnis has agreed to deliver the Interstate Company over to the Bell interests. A copy of the alleged agreement appears in the petition, together with a schedule of the prices at which he agreed to deliver the securities of the independent concerns over to the Bell interests. An injunction is also asked to prevent this delivery.

OAKLAND, CAL.—The suit of the city of Oakland against the Home Telephone Company for the recovery of $100,000 forfeited by the terms of its franchise at the time of its merger with the Pacific Telephone & Telegraph Company, may be dropped as the result of a pending compromise, by which the city will receive 2 per cent annually on the gross income of the Pacific company's systems until 1956, which will amount to some $2,000,000. A proposal for settlement of the suit was made to the Oakland City Council by the telephone company some weeks ago on the following basis: The suit against the company to be withdrawn; the telephone company to be permitted to operate under the provisions of the former Home Telephone Company; the Pacific company to pay to the city 2 per cent on its gross income in Oakland during the life of the Home company's franchise. After several conferences between the telephone officials and Mayor Mott, the city attorney and members of the city council, the advisability of accepting the compromise was referred for consideration to the Tax Association of Alameda County, which found that the terms of the agreement were advantageous to the city. The Home Company was granted a 50-year franchise in 1906.